VENTILATING

A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL AIR CONDITIONING, REFRIGERATION, AIR SANITATION, PIPING, HEATING AND VENTILATION

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CONTENTS FOR SEPTEMBER, 1945

VOLUME 42 NUMBER 9

Washington News 61
Loring F. Overman

The Climatometer—An All-Weather Room 65
F. G. Hechler

It's the Law 69
Leo T. Parker

Evaporative Cooling for Arizona Plane Plant 72

Special Section—Air Conditioning for the Veteran 73

Reference Data 301-302 80

Picture Paragraphs 81

Forced Warm Air Design for a Small Hotel 82
P. A. Croney

Beware of Elbows 87
John J. Woolfenden

Graphite Bearings and Seals 88

Heat Losses Through Floors of Basementless Buildings 89

EPD Submerged Pipe Line 91

Services for a Research Laboratory 92
L. G. Griebling

Curtiss-Wright High-Speed, High-Altitude Wind Tunnel 94

Flow of Steam Through Orifices 95
Charles A. Pohlig

The Solar House: A Full-Scale Experimental Study 96
F. W. Hutchinson

Caves Used for Cold Storage Plant 97

News of Equipment and Materials 98

News of the Month 100

Abstracts and Reviews 110

Getting Personal 112

Since the Last Issue 112

New Catalogs 121

Army-Navy "E" Awards 123

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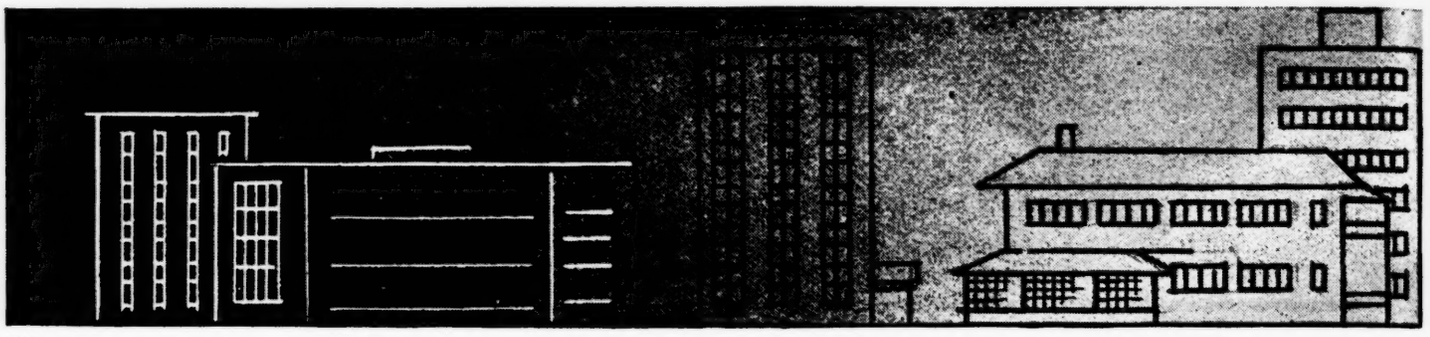
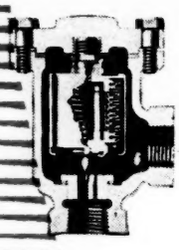
THIS MONTH'S COVER

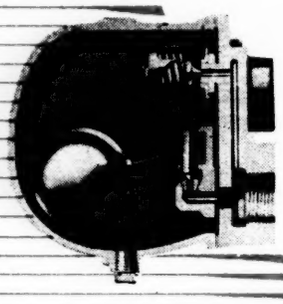
Wide World Photo shows dischargees on their way to check out at a separation center. Some of these may seek a future in the air conditioning business, and their choice may be guided by the special section beginning page 73.



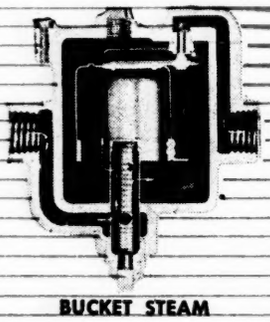
TOMORROW'S BETTER . . . . .



THERMOSTATIC STEAM TRAP



FLOAT-THERMOSTATIC STEAM TRAP



BUCKET STEAM TRAP

87 TRAP-CONTROL

If you are responsible for heating performance and heating costs in a theatre, commercial or industrial building—the chances are that you can increase the over-all efficiency 10 to 25%.

If the system was installed more than ten years ago—Sarco's technical developments and improvements alone would justify modernization.

If recently built—it was probably engineered for rush construction and the right steam traps and control may not have been available at the time.

In any event, it will pay any engineer to go over the latest developments in Sarco Products as a check against his heating operations. A few examples are given on these pages. Complete data in the Sarco Bulletins. Sarco Engineers located in all large centers are ready to inspect your heating system, without obligation.

FOR INSTANCE, the new Sarco Thermostatic Steam Trap has double its former capacity to discharge condensate or air. It now has the power and speed of a bucket trap—and greater efficiency.

FOUR STARS ON OUR E PENNANT TESTIFY TO SARCO PERFORMANCE IN THE WAR EFFORT

Represented in Principal Cities

SARCO

SARCO COMPANY, INC., 475 FIFTH AVE., NEW YORK 17, N.Y.

Washington News

LORING F. OVERMAN

Production restrictions reduced.

Air conditioning and refrigerating manufacturers may telescope a decade's advance.

Industry is largely on its own for reconversion.

Construction springs released.

Some controls remain.

SOMETHING akin to the atomic bomb that flattened Japanese resistance has struck the War Production Board, completely disintegrating more than 300 wartime restrictive orders and appended schedules since the announcement of Nipponese surrender. At the current rate of cancellation, it appeared that not more than 40 orders would remain in effect during September, out of 650 in effect on VE-Day. It was even considered possible that the total might be reduced to fewer than 30, since such restrictions as L-335 (the over-all lumber control order), which was assumed by many would remain in effect, was rendered almost meaningless on August 22 by revocation of several schedules.

Thus it can be said today that those who engineer and execute the plans of the heating, ventilating and air-conditioning industries are, for the first time since Pearl Harbor, completely free of direct control from Washington. What little indirect control remains is expected to expire on September 30, when the Controlled Materials Plan (CMP), will relinquish its direction over the basic shapes of steel, aluminum and copper. The ending of CMP and of the present AA priorities system on September 30 instead of December 31, as previously announced, is provided for in Priorities Regulation 29, revised August 22.

Industry to Publicize

How the manufacturers of air-conditioning and refrigerating machinery evaluate the rapid turn of events is indicated by the fact that during the last week in August directors of their national trade association were to vote on plans for a national publicity and public relations campaign. While hesitating to forecast results of the vote, industry informants indicated that the time has come to sell the American public on air conditioning and refrigeration as an absolute necessity backed by the successful experience of the world's most efficient war production and war making machine.

And what a wealth of promotional material awaits the publicist chosen for the assignment! During three and one half years of war, refrigeration and air conditioning engineers have perfected techniques of industrial, maritime and military applications which might have required a decade to perfect under other than emergency conditions. Their adaptation to civilian industrial and commercial practice will now be relatively simple, and they can be marketed as backed-by-results achievements rather than as visionary proposals.

The engineers of tomorrow's refrigeration and air-conditioning installations will do more than dust off and touch up the tracings on 1941 drawing boards. Their sales horizons may skip a full decade, taking up at a point they may have hoped to reach by 1950.

Green Light Flashed

Indeed, it is the hope of Washington post-war planners that industry will adopt a "sky-is-the-limit" attitude as the result of blanket revocation of all restrictions but those governing admittedly scarce items and materials, or those intended to break bottlenecks, to continue cutback military requirements, and to prevent unnecessary hoarding of materials. It is realized in Washington that industry has won its military battle, but that the same kind and degree of ingenuity and effort will be needed to win the battle of reconversion.

Industry has convinced Government that this next battle can be handled best if controls are minimized. Industry is to be given opportunity to prove its claim.

Blanket Revocations

Among recently-revoked orders of either direct or indirect interest to the heating, ventilating and air conditioning industries are the following:

L-79—Distribution controls over plumbing, heating and cooking equipment. As most recently amended it restricted the sale of furnaces, boilers, radiators and water heaters to rated orders and for necessary replacement.

U-7—All war restrictions on the acceptance of all types of additional space heating and industrial consumption of gas by utilities companies have been removed by revocation of remaining portions of the order. At the time of its revocation the space-heating restrictions of the order applied to natural and mixed gas utilities in the District of Columbia, New York, Pennsylvania, Maryland, Virginia, West Virginia, Kentucky and Ohio; most other natural gas companies had previously been exempted from these provisions of the order. In announcing revocation of the order, the Office of War Utilities informed all manufactured gas utilities that it was withdrawing previous requests that companies refrain from promotional sales campaigns to add new space heating and industrial consumption so long as supplies of oil used for enrichment of manufactured gas remained tight. The mandatory order restricting new manufactured gas uses was revoked last spring following VE-day.

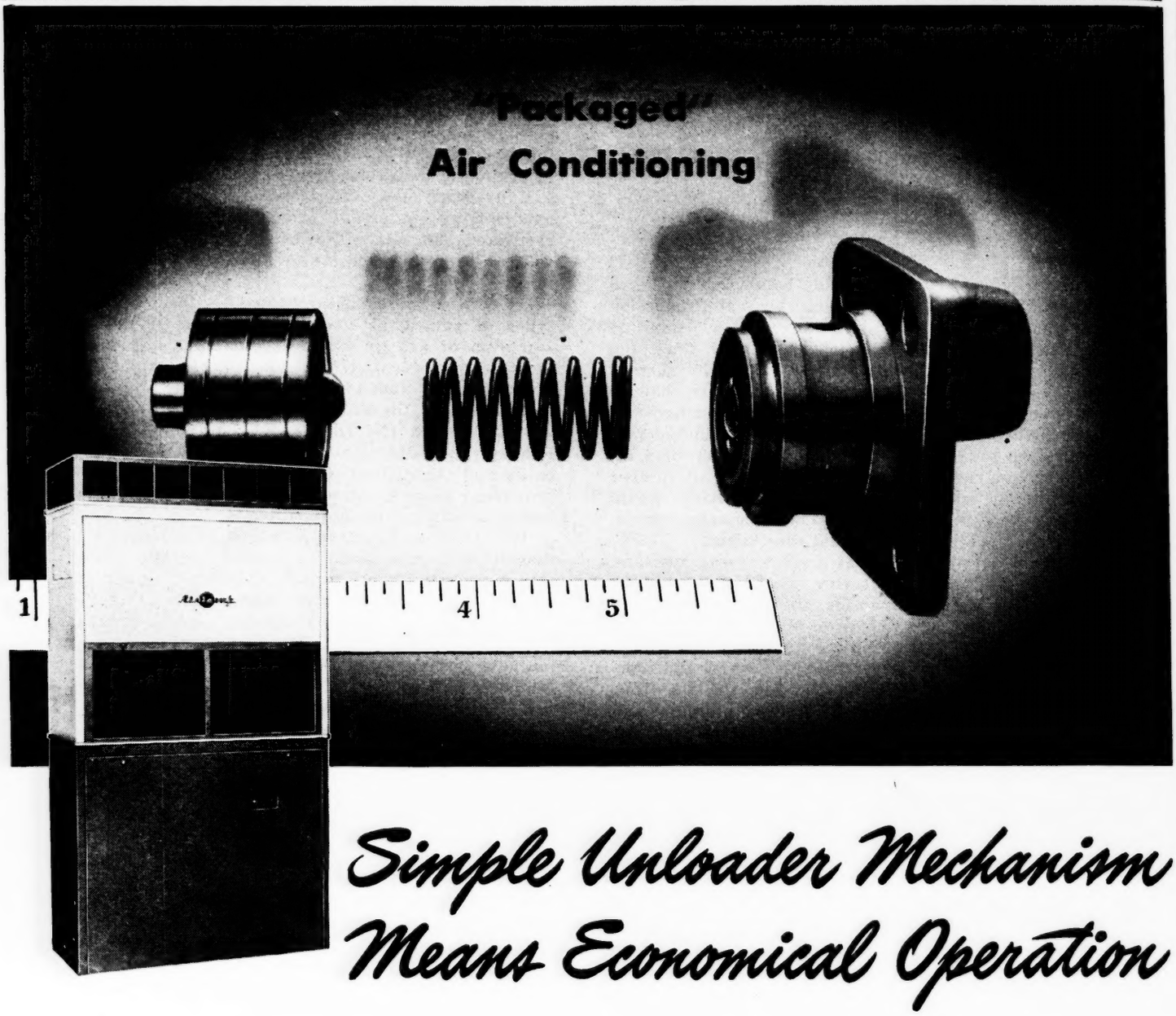
L-42—Plumbing and heating simplification.
L-42, Schedule 4—Cast iron soil pipe and fittings.
L-349—Oil burning equipment.
L-272—Industrial type instruments, control valves and regulators.
L-272, Schedule 1—Control valves.
L-272, Schedule 2—Liquid level controllers.
L-272, Schedule 3—Pyrometers and resistance thermometers.
L-272, Schedule 4—Indicating dial pressure gauges.
L-154—Power, steam and water auxiliary equipment.
L-176—Domestic and commercial electric fans.
L-5-c—Domestic mechanical refrigerators.

Construction Order Eased

Next to the revocation of orders which prevented the manufacture and distribution of much civilian refrigeration and air-conditioning equipment, of major interest to the industry is a WPB action showing where to look for the first sales fruits of reconversion. This action is the amendment of Order L-41 (Construction), by issuance of Direction 7, on August 21, letting down all bars to six types of industrial construction. Controls over residential construction will be retained through September 30—possibly longer—with stimulation of industrial building favored as the most logical step toward speeding reconversion.

Citing pre-war figures as an indication of possible volume of industrial construction in the reconversion period, WPB said that the annual average volume during the years 1920 through 1929 was $560 million, with a peak of $889 million. Present estimates for 1946 are slightly over $1 billion. Under the new direction to L-41

CHRYSLER AIRTEMP



Simple Unloader Mechanism Means Economical Operation

The Chrysler Airtemp hermetically sealed compressor gets a good running start before picking up the load. When not in operation suction and discharge pressures are equalized. A spring allows by-pass to remain open until the compressor comes up to speed (⅓ to ½ a second)—then oil pressure closes the by-pass. This permits the use of a normal torque, low inrush motor requiring a minimum starting current. Unloaded starting is another one of the many built-in features which results in efficient operation and low up-keep.

The Chrysler Airtemp hermetically sealed compressor seals out air, dirt and moisture permanently. It is designed for long, trouble-free service. The compressor of the "Packaged" Air Conditioner, pioneered by Chrysler Airtemp, is pressure lubricated and all vital moving parts are Superfinished. For time-tested and proven temperature-humidity control equipment turn to Chrysler Airtemp. You will find there is a capacity range ideal for practically every need. • Airtemp Division of Chrysler Corporation, Dayton 1, Ohio.

Invest in Your Future—Buy War Bonds! "Listen to the music of Andre Kostelanetz, Thursdays, CBS, 9:00 p.m., E.W.T."

HEATING • COOLING • REFRIGERATION

the following types of construction are permitted without WPB authorization:

(1) Mining, smelting and refining, foundries and other operations related to extraction of minerals and their conversion to finished form;

(2) Logging and lumbering operations, sawmills, planing mills, and millwork manufacturers;

(3) Pilot plants and industrial research laboratories;

(4) Food processing plants, slaughterhouses, commercial food freezing plants, commercial cold storage warehouses and food packing plants, bottling plants, grain elevators and canneries (but not retail food stores or frozen food locker plants serving individual customers);

(5) Textile mills, cotton mills and similar establishments; and

(6) Printing and publishing establishments, including those publishing newspapers or printing books, magazines or periodicals.

One of the late-August surprises in most Washington circles was the drastic relaxation of the over-all lumber control order, L-335. It had been expected that shortages of lumber would prove a bottleneck to many of the relaxations authorized by the amended Construction Order, but military cutbacks changed the picture completely. As amended, the order permits the sale of any kind of lumber to any buyer on uncertified and unrated orders provided delivery does not interfere with the filling of certified and rated orders.

Lumber production for 1945, on the basis of production to date, will amount to about 29½ billion board feet, with an additional 1½ billion feet from stocks and imports. For the first six months of 1945, direct and indirect military needs amounted to 12 billion board feet out of the total available supply of 15½ billion. According to preliminary estimates, the over-all military requirements for the second half of the year may drop as low as 4 billion feet. For the period 1941 through June 1945, total consumption of lumber was 171 billion board feet, of which 57.3 per cent was used for direct and indirect military needs.

Oil Rationing Ends

Although almost ancient history, too important to pass up entirely was one of the industry's first dividends of victory — revocation of fuel oil and gasoline rationing orders. Coupled with the removal of all restrictions on production and distribution of oil-burning equipment, here is another slate wiped clean.

How complete is the demise of the oil problem is indicated by the announced plans for liquidation of the Petroleum Administration for War at an early date. The Facility Security Division of PAW will receive orders within 30 days to reduce its personnel, and other divisions of the agency expect to complete their work by the end of the year. Existing controls in the production, refining, transportation and marketing branches of the oil industry will be withdrawn rapidly; all quantity and quality restrictions upon civilian consumption of petroleum products have already been terminated.

Controls Remaining

Indications are that the last wartime orders to be revoked will fall into three groups—remaining controls over lumber and paper, over some of the major textile and leather products, and over materials dependent upon supplies from the Pacific. Relaxation of the over-all lumber control order and of some of the paper container orders indicates that restrictions in this group will be shortlived. Needs of occupation forces will determine the duration of controls in the textile field.

Involved in the Pacific group are rubber, tin, tin scrap, tin cans and collapsible tubes, tin closures, hog bristles, kapok, corundum, diamonds, loofa sponge and the basic cause of all of the fireworks—uranium.

In addition to these orders, WPB will retain some control over residential construction, and the General Scheduling Order M-293 will be kept for use should a serious shortage in any item of industrial equipment occur in the next few months. It is also anticipated that Inventory Control Orders L-63, L-219 and M-161 will be continued, as will the Imports Control Order, M-63.

Something New

As an exception to its general policy of revoking everything possible, WPB is writing up something entirely new in its Priorities Regulation 32, making it against the law to wilfully duplicate orders. Intended to block any who might be tempted to place a flock of purchase orders with different firms, intending to cancel all but the first to make delivery, the new regulation would forbid the placing of two or more orders for the same materials or components. Possible are fines or jail sentences for knowing violations.

Purpose of the regulation is obvious and commendable —to make certain that all orders are firm, and to distribute available business and production facilities as widely as possible. Otherwise, WPB reasons, wholesale cancellations could easily become one of the major headaches of the transition period.

Pricing Bottleneck

Over-all estimate in Washington is that th scramble for materials and components may be somewhat hectic, but that in most instances the supply pipeline will be well filled within 120 days. Many producers, however, are reporting that low reconversion price ceilings will become a major bottleneck. OPA is continuing to sit tight, warning that the most serious inflation came *after* the Armistice that ended World War I. Despite this warning, some stretching of the price line appears inevitable.

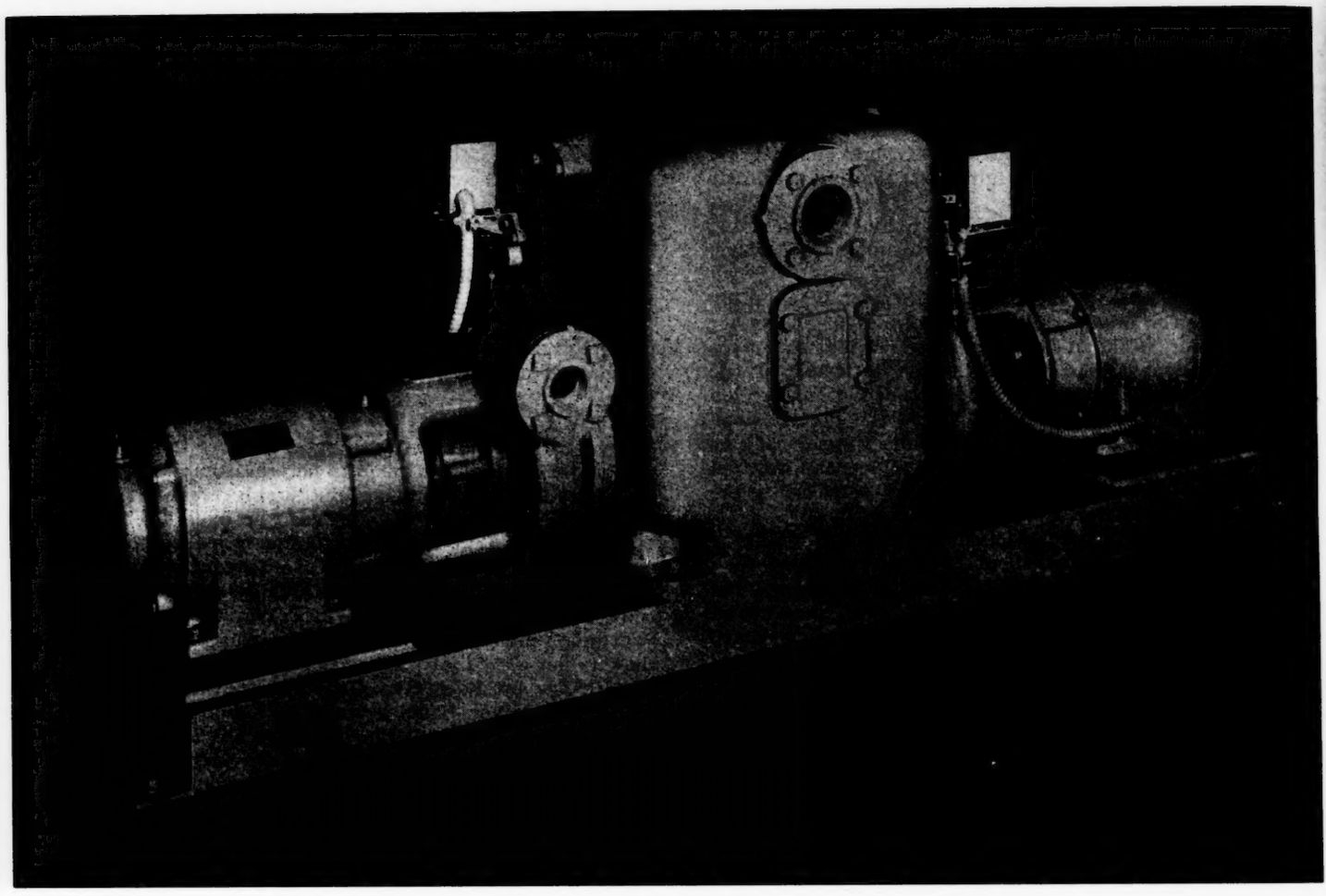
Already, by Executive Order 9599, voluntary wage increases previously subject to War Labor Board control may be made provided the increases are not cited as a basis for requesting price relief. Treasury Department salary controls are expected to follow suit. Although using such increases as arguments for ceiling price advances is specifically prohibited, it is questionable whether inevitable pressure may change this provision.

WPB, for example, is being asked to exert every effort to break any bottlenecks that may appear. In some instances priorities may provide the answer. In many building material lines, lack of manpower, due to low wages based on low priced products, may prove to be the cause. It is reported that the brick industry is now producing at only 17% of pre-war capacity, with many Midwest plants a year behind on orders. Claim is that manpower is only a fraction of what is needed, with higher wages, based on higher ceiling prices, as a must. Makers of some other building materials, now sorely needed for an essential unit of the reconversion program, are said to be in a similar position. It is anticipated that when WPB gets to the bottom of any such bottlenecks, it may assist in speeding settlement of wage and price adjustments.

Back to "Normal"

Being relieved of wartime controls and given the go-ahead signal has its price—the sudden withdrawal of billions of wartime spending. This cannot help but involve some recession, the extent of which will be determined somewhat by individual efforts to substitute constructive selling for the cafeteria distribution prevalent since 1941. In the heating, ventilating and air conditioning industries, constructive selling originates in the designing, engineering and drafting departments. From these will come the peacetime adaptations of wartime achievements. Fortunately for these industries, reconversion involves a change of customers rather than of products. With this head start, with expanded facilities available, and with an enviable war record upon which to base constructive selling, the heating, ventilating and air conditioning industries should indeed be among those well out in front as the back-to-normal race gets under way.

MAXIMUM EFFICIENCY FOR STEAM HEATING SYSTEMS ON HEATING, DRYING AND PROCESS WORK.



JENNINGS CONDENSATION PUMPS

Designed for steam systems on heating, drying, or process work, these pumps offer the most reliable and efficient means of returning hot condensate to boiler or hot well. In many cases these pumps will save costly installation of boilers in a pit to provide gravity flow of returns from basement radiators and heating devices.

The Jennings Condensation Pumps are sturdy and compact in construction, and combine receiving tank, pump and driving motor in a single assembly. Pumps are bronze fitted throughout, with tobin bronze shaft. The pumping impeller is of special design, made possible by our wide experience with return line heating pumps, and is especially adapted for handling hot water with the greatest possible efficiency.

Full automatic control is furnished by means of a ball float and float switch mechanism mounted on the receiving tank. All wiring is made up at the factory, and it is necessary only to connect the pump to the system and hook up the leads. Complete information regarding these economical pumps sent promptly on request.

THE NASH ENGINEERING COMPANY

SOUTH NORWALK, CONNECTICUT, U. S. A.

The Climatometer —An All-Weather Room

F. G. HECHLER

Director, Engineering Experiment Station, The Pennsylvania State College

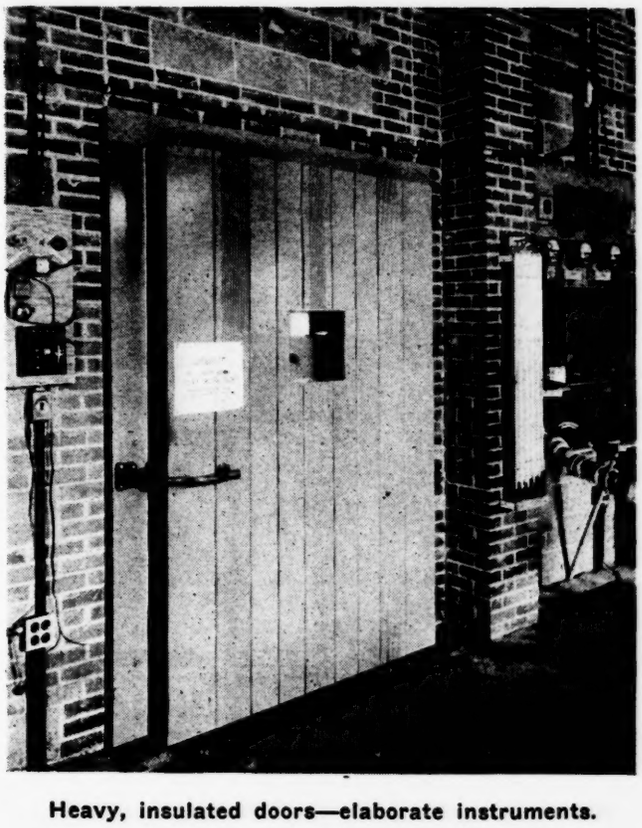
The performance of building materials—both standard and substitute—will be examined in an all-weather room at Penn. State College. Weather from the tropics to the poles, including rain and sandstorms, can be reproduced in the climatometer.

WHEN the United States entered the war it became necessary to send materials and supplies, including housing and shelter, to all parts of the world where they were exposed to every kind of climate including arctic cold and tropic heat. Because of critical material shortages, numerous suggestions were received proposing new and substitute materials for this purpose as well as for emergency low-cost housing. Little reliable information was available regarding the performance of standard materials under extreme conditions and nothing whatever was known about most of the substitutes proposed. To provide information quickly and economically, and if possible to correlate the results with those obtained by accepted laboratory tests, the Office of Production Research and Development, War Production Board, sponsored the development of an all-weather room at The Pennsylvania State College.

To obviate the need for duplication of equipment already available the new laboratory was built as an addition to the Heat Transfer Laboratory of the Engineering Experiment Station. This laboratory had complete facilities and experienced personnel for making heat transmission tests by the accepted guarded hot plate and hot box methods for mean temperatures from 25F up to 1000F.

In order to provide the desired data economically and expeditiously the following requirements were set up:

The test specimens should be large enough to be representative sections of walls or structures.



Heavy, insulated doors—elaborate instruments.

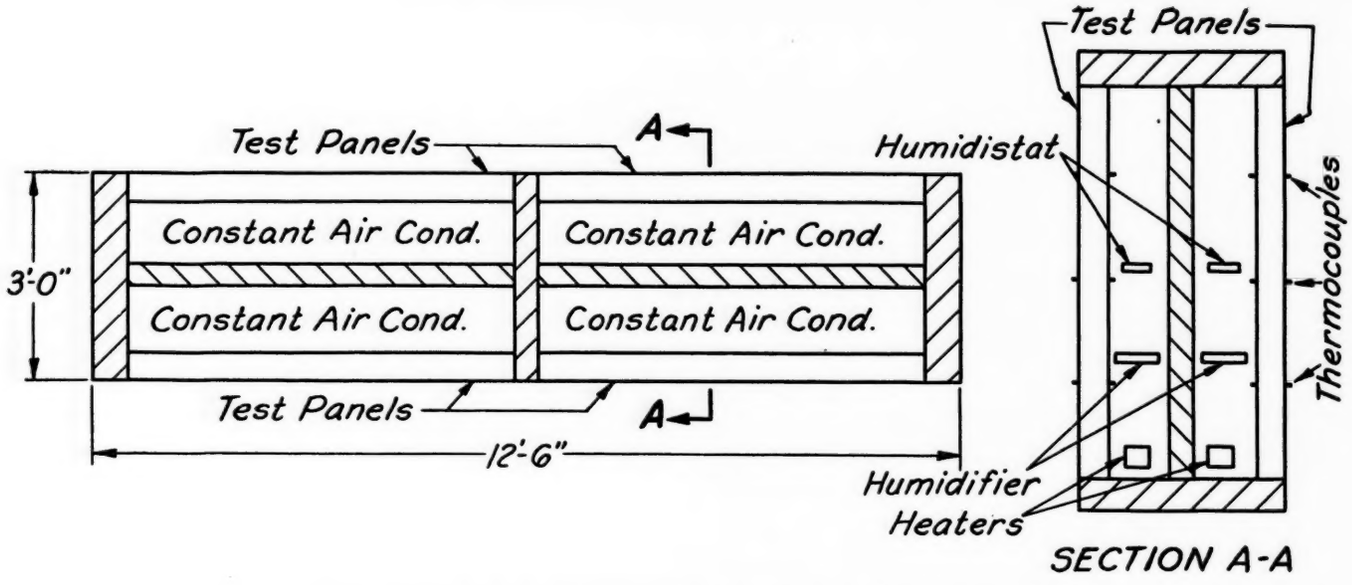


Fig. 1. Schematic drawing of test cubicle showing four test panels in position. Air outside panels is varied while heat required to maintain inside temperature of 70F is measured.

The room should be large enough to permit the testing of twelve materials or constructions simultaneously.

The heating and cooling equipment should be adequate to provide temperatures similar to those prevailing in tropic and arctic regions, that is a maximum of +130F and a minimum of —60F, with sufficient capacity to attain the desired temperatures in a reasonable time.

Provision for varying the humidity over a wide range independently of the dry bulb temperature.

Methods for producing simulated rain on the test samples.

Batteries of infrared lights to give surface heating similar to that produced by sunshine.

It should be possible to study the effects of surface erosion with simulated sand storms.

Before discussing the details of the design adopted

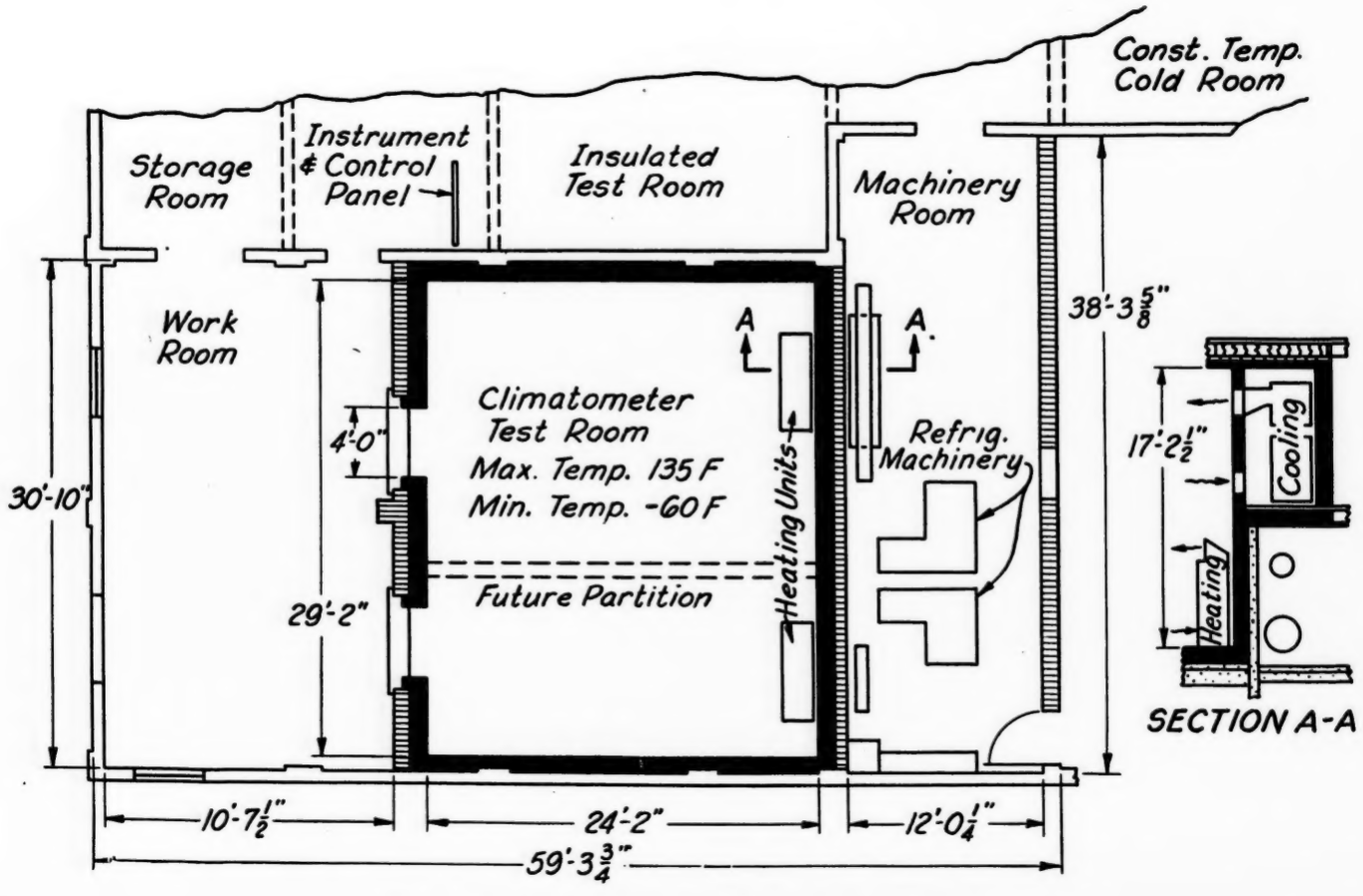


Fig. 2. Layout of test room and auxiliary facilities.

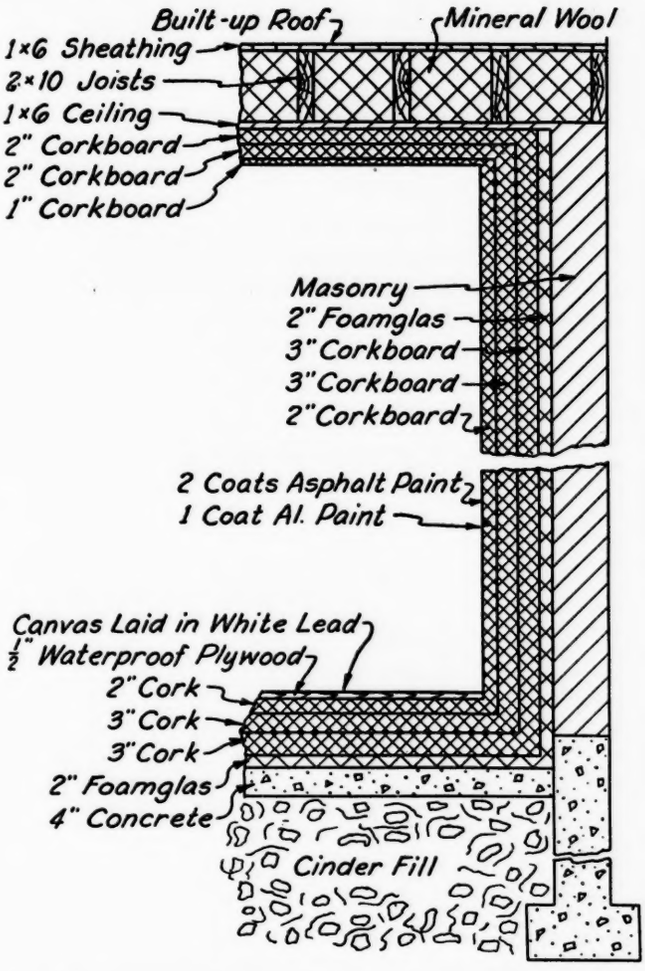


Fig. 3. Heavy insulation surrounds the climatometer.

to meet these requirements it may be helpful to consider some of the factors that influenced the decisions. The performance of many common building materials under usual conditions is well known from long experience. We also have acceptable data regarding their thermal conductivity under ideal laboratory conditions when dry and with constant heat flow. These ideal conditions seldom occur outside of the laboratory. The addition of insulation to a wall without the use of an effective vapor barrier may cause an accumulation of moisture in the wall and, from the very nature of things, we rarely have the constant temperatures required to give constant heat flow.

To what extent these factors affect heat transmission and consequently fuel consumption is not known. The facilities of the climatometer, however, appear to offer a method for investigating these effects under controllable conditions simulating actual weather cycles as desired.

Briefly, the procedure as now planned is to prepare test specimens or walls of any desired construction 5 ft 7 in. x 5 ft 7 in. in area so that they may be tested in the guarded hot box while dry and under steady heat flow conditions to determine the conductance and transmittance. Following the test in the guarded hot box the test specimens will be mounted in a test cubicle shown schematically in Fig. 1. Each cubicle will accommodate four specimens; the temperature within each compartment will be kept at 70F while the outside ambient temperature is made to follow any desired pattern. The heat required to maintain the temperature at 70F will be measured and a series of thermocouples located at strategic points on and in the wall will give the temperature gradient. It is anticipated that changes in the heat requirements or in the temperature gradient curve will indicate changes in the wall structure. For example, if the ambient temperature alternately changes from 70F to —10F the alternate freezing and thawing of the wall surface if there has been moisture absorption may cause a physical and thermal breakdown that can readily be detected. All of the specimens are subjected to the same conditions and by making some of them of materials that are known from experience to be satisfactory it should be possible to evaluate the probable service performance of new and substitute materials as well as to find out how they will behave under extreme conditions.

The general arrangement of the test room and its relation to the adjacent machinery and work spaces and other laboratory facilities is shown in Fig. 2. The inside dimensions of the climatometer are approximately 24 x 29 feet with a 17 foot ceiling. These dimensions are adequate to accommodate a small test house if desired. It is expected that a

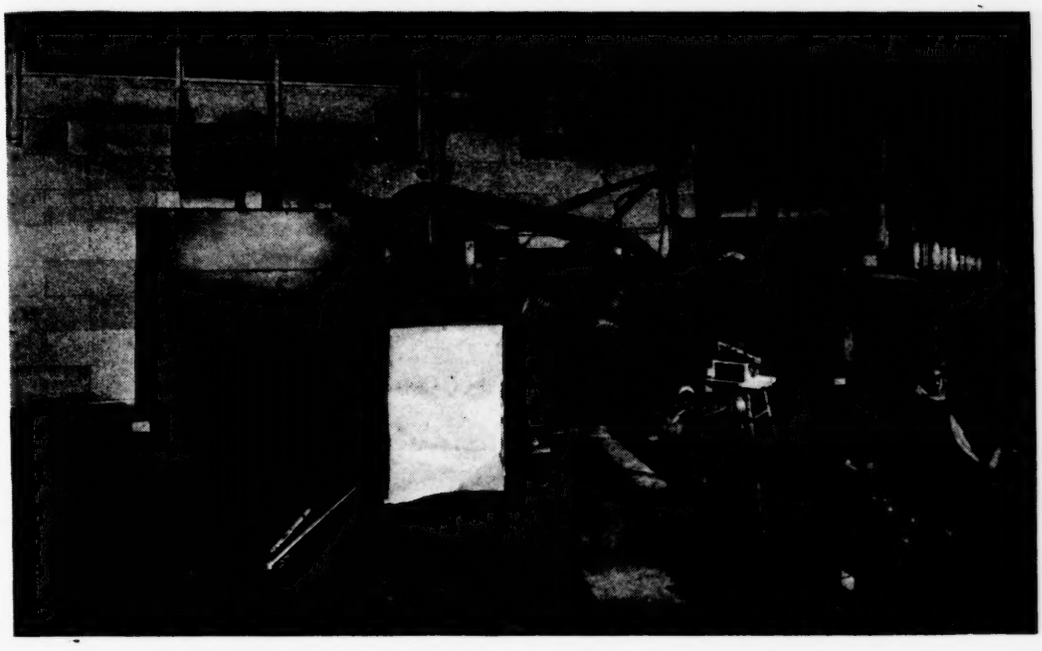


Fig. 4. Heating units with humidifiers. Dampers at top open to cooling chamber.

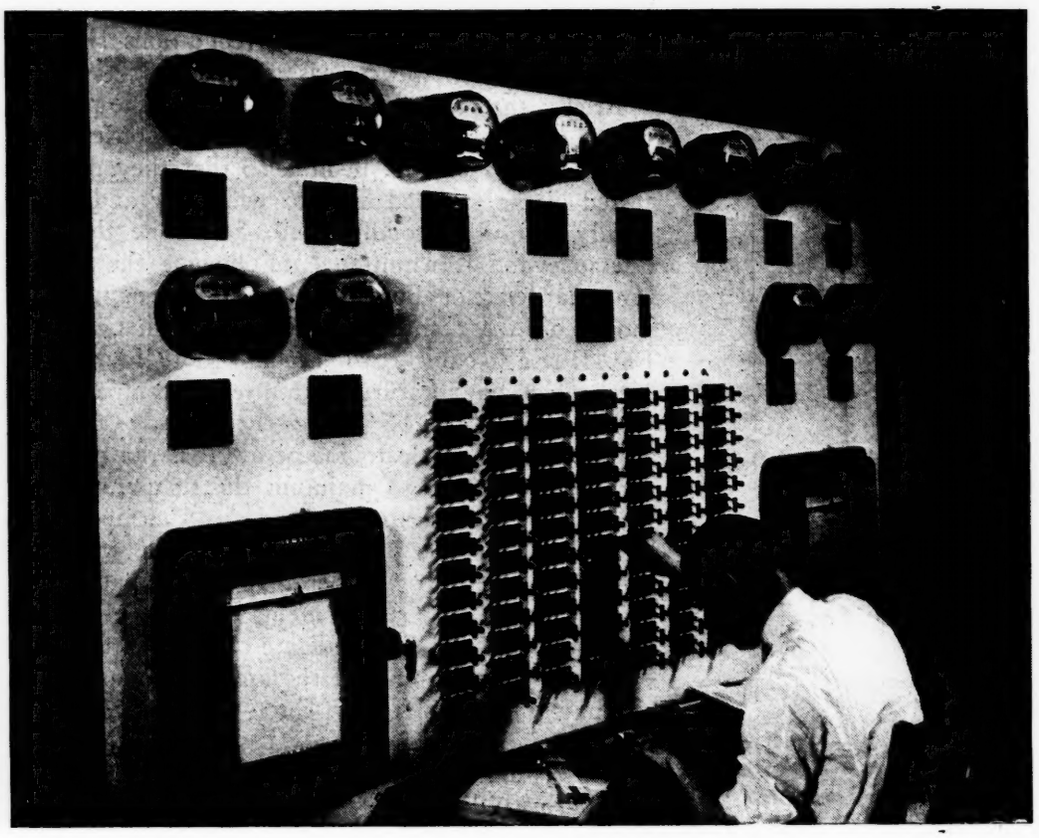


Fig. 5. The control panel, nerve center of the climatometer. Each of 12 test cells has its own watt-hour meter. Two recording potentiometers show test conditions at selected spots while a third potentiometer can be switched to any one of 168 thermocouples.

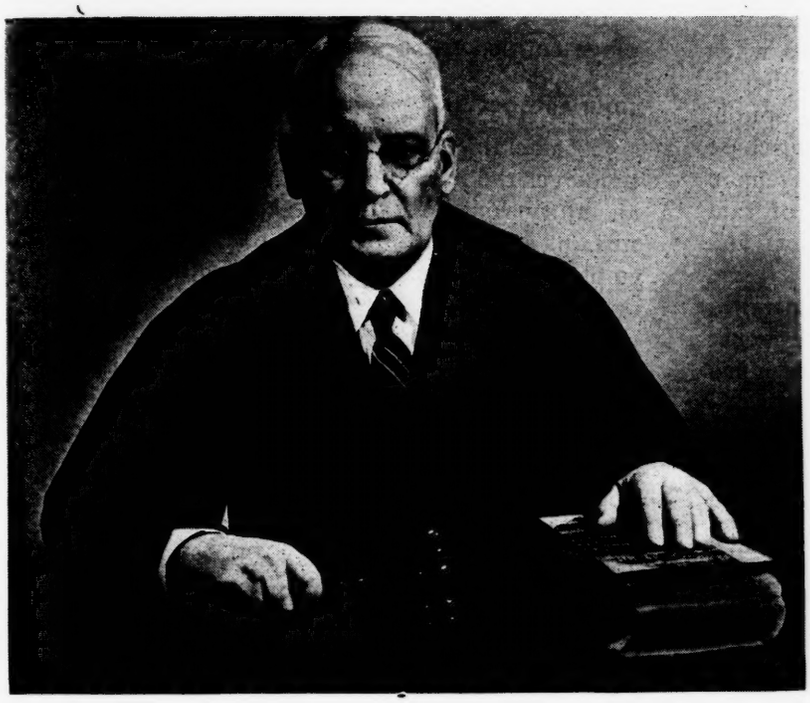
partition will be added in the future to provide more flexibility in test programs by permitting the use of different conditions in the two rooms. All of the facilities have been arranged to permit this by providing two refrigerator doors each 4 ft x 7 ft 4 in., two heating units and two cooling units both served by the same refrigerating system.

The range of temperatures and humidities imposes severe stresses on the insulation of the climatometer due to alternate expansion and contraction and possible accumulation of moisture. Fig. 3 shows the construction used. All board insulation was dipped in hot asphalt for erection. No wooden pegs were used for securing the inside layer of cork board; when used they provide a path along which moisture readily enters the insulation. The usual asphalt emulsion finish on the inside was omitted because the difference in the expansion of the asphalt and the cork board causes serious cracking in large wall areas when the temperature range is large. The inside surface finish consists of two coats of asphalt paint sprayed on and a final coat of aluminum paint. The plywood and canvas floor was used instead of concrete to reduce the heat capacity.

The heating units, Fig. 4, with fan capacities of 4000 and 2300 cfm and heating capacities of 300,000 and 200,000 Btu per hr, respectively, are placed on the floor opposite the entrance doors. Each unit is equipped with a spray humidifier arranged for either steam or water. The pivoted dampers above the heating unit open into the plenum chamber housing the cooling units. These units are placed on a mezzanine floor directly over the refrigerator compressors. The heat exchangers have direct expansion ammonia coils; the normal air capacities are about 10,000 and 7,000 cfm, respectively. There are two ammonia compressors; a two-cylinder, 6 in. x 6 in. — 400 rpm high stage and a two-cylinder, 10½ in. x 7 in. — 400 rpm booster unit.

For temperatures down to about —20F the 6x6 compressor is adequate; for lower temperatures both units are used. The piping has been arranged to provide the necessary flexibility for obtaining or maintaining any desired conditions in the climatometer. A photograph of the instrument and control panel which is the nerve center of the test equipment is shown in Fig. 5. The watt-hour meters have special gear trains to permit accurate reading of power required by the test cubicles to one watt. Two sixteen-point Micromax potentiometers give a record of temperatures at selected points in the materials under test to indicate any departure from normal. A potentiometer is conveniently mounted flush with the surface of the table; it can be connected selectively through the switches shown to any one of 168 thermocouples in the climatometer. For convenience the potentiometer scale is graduated to read directly in degrees F. The galvanometer is placed below the table with the scale visible through the rectangular slot behind the potentiometer.

Difficulties in obtaining materials and equipment delayed completion of the climatometer. Eventually, before it was ready the Bureau of Ships, U. S. Navy, requested permission to use the facilities for investigations requiring controlled temperatures from 0F to 100F and humidities from 15% to 75% with adequate space for erecting machines and testing accessories. These tests have been in progress for the past year with such satisfactory results that the program has been materially extended. This has precluded any testing of building and insulating materials; however, when conditions permit the original program will be undertaken. In the meantime requests for permission to use the climatometer for a variety of tests for which it seems well adapted have been received and the potential field of usefulness is continually growing.



It's the Law

LEO T. PARKER

Many heating contractors, and other sellers of heating plants, waste a great deal of time, effort, expense, and inconvenience in defending law suits. It is readily apparent that readers who know the cause and outcome of recent heating suits may avoid legal controversies. This is so because litigants familiar with the modern law may prepare in advance to win law suits. Thus, readers may wish to save the following paragraphs and file the reported cases.

FREQUENTLY property owners refused to pay heating contractors for installed heating plants on the contention that the plant will not heat the building, or that it is inadequate in size and capacity. It is important to know that if the property owner failed *positively* to prove his contentions, the court will hold the contractor entitled to recover the *full* contract price. Moreover, the courts will not listen nor consider testimony of property owners who complain of *trifling* defects in a heating system.

For example, in Petite v. Homes, 41 Atl. (2d) 71, reported March, 1945, the testimony disclosed that a heating contractor took a contract to install a hot water heating system in an apartment building. When the job was completed the owner complained that the plant was consuming too much fuel. By investigation, it was found that the oil feed line was leaking. This trifling defect *was* never rectified by the contractor. The owner contended that the system would not heat the house and refused to pay the contractor. The latter sued the owner to recover the full contract price.

During the trial the owner and also two of his tenants testified that apartments were *not sufficiently* heated. However, the property owner did *not* prove that the heating system was inadequate to heat the apartments, although he proved that another contractor who had inspected the system, said: "I told you that this boiler was not big enough to heat this building, no matter whether you put one booster or ten boosters on it."

The higher court refused to listen to this statement, and held the contractor entitled to recover the full contract price. This court said:

"Insufficiency of the plant to heat adequately is not shown by evidence that on occasions it did not heat adequately, without showing that it was properly operated, with sufficient fuel. . . . . We find no legally sufficient evidence of any breach of contract relating to the heating system, except the alleged failure to repair the oil leak."

Mortgage Prior to Contract

Considerable discussion has arisen from time to time over the legal question: If a heating system or plant, sold under a conditional sale contract, can be removed from a building without injury to the building, can the seller remove the system from a mortgaged building when the property owner defaults in paying for the system? In June, 1944, a higher court rendered an unusually important decision on this law.

See General Heat & Appliance Company v. Goodwin, 54 N. E. (2d) 676. In this case it was shown that a heating company sold and installed in a dwelling a "Delco-Heat Conditionair". By the terms of the contract the seller or company retained legal title to the system until paid for by the property owner. The contract contained a clause: "It is understood and agreed that title to said property (heating system) . . . shall not pass to the buyer until the total purchase price with interest . . . shall have been fully paid . . . (and) said property shall remain personal property and shall not become a

part of the realty, . . . In the event of the failure of the buyer to pay any of said installments when due, . . . at the time and in the manner herein specified then . . . the seller may, at its option, declare the entire balance of the unpaid purchase price at once due and payable . . . and thereupon the seller may take immediate possession of said property, including all equipment, attachments and accessories thereon. . . ."

The property in which the system was installed was a wooden-framed single family dwelling house about forty years old and it was originally designed for warm air heat. There were ducts for the transmission of air leading from a warm air furnace along the basement ceiling, to which they were fastened by screws and bolts or suspended by wire loops, and thence continuing up through the walls and opening out into registers and grilles. In other words, the new system could be removed without any injury to the property or house. It could be easily taken to any other dwelling, where it would operate upon assembly and connection with the electricity, oil, and duct works.

The property owner failed to pay the contract price, and the heating company sued to gain possession of the heating system. However, the testimony showed that six days *prior* to installation of the heating system a man named Hyde took and recorded a mortage on the property. Hyde foreclosed the mortgage and thereby became legal owner of the property.

This higher court held that the heating company could *not* remove the heating system from the building, because the mortgage had been recorded *before* the system had been sold and installed.

On the other hand, this same court held that if the owner had not mortgaged the property, or if the mortgage had been recorded *after* sale and installation of the system, the heating company could have removed the system from the building.

Testimony Sufficient

Generally speaking, the higher courts do not require an employe to *positively* prove that an injury arose from his employment in order to recover compensation under the State Workmen's Compensation Act.

For example, in La Porte v. Kalamazoo Stove and Furnace Company, 14 N. W. (2d) 539, reported June, it was shown that an employe of the Kalamazoo Stove and Furnace Company sued to recover compensation under the State Workmen's Compensation Act for the loss of vision of the left eye. The employe had worked for many years for the furnace company. In 1934, he had eye trouble resulting from sand getting into his left eye. He had a recurrence of eye trouble in 1939. He claimed that on April 2, 1942, while pushing a full ladle of molten iron on an overhead track in the foundry, some of the metal spilled over the side of the ladle, fell to the floor and either a piece of the metal or a piece of cement flew up and struck him in the left eye. He was seen to put his hands up to his eyes and cry out with pain.

In view of testimony the higher court held the employe entitled to an award based on loss of his eye.

Injury Reoccurs

Considerable discussion has arisen from time to time over the legal question: If an employe sustains an injury while working for an employer, and later sustains a similar injury while working for a different employer, who must pay the compensation—the first or last employer?

In Brown v. Allied Heating Company, 30 Atl. (2d) 290, it was shown that an employe sued the Allied Heating Company for compensation under the State Workmen's Compensation Act. During the trial testimony was given, as follows: The employe while working for August Arace hurt his back while threading pipe. At the time he was making $80.00 to $90.00 a week, sometimes $120.00, part of which was overtime. However, two years earlier the employe had injured his back while working for the Allied Heating Company.

In view of the fact that the second injury was held to be a *recurrence* of the first injury the higher court held the Allied Heating Company solely liable for payment of compensation.

Law of Patents

It is useless to expend money for a patent not based upon certain rules which result in invalidity of patents. For example no valid patent may be obtained on: (1) A principle known to science; (2) a mere result; (3) a property of matter; (4) an aggregation of old parts which do not act together to produce a *unitary* result; (5) a system for doing something; (6) things having an immoral object; (7) things created by "mechanical skill", and which do not require "inventive ability" to perfect; (8) all devices that are inoperative and impractical; (9) all devices that are not new and useful; (10) and all other things which have been described in any publication, or patented in this or any other country.

The fact that an inventor is granted a patent means only that a Patent Office official *believed* that the inventor deserved a patent. However, at anytime later it may be proved that the Examiner was in error. If so the inventor may have to forfeit his patent.

For example, in Timken Detroit Axle Company v. Cleveland Steel Products Corporation, 148 Fed. (2d) 267, reported May, 1945, it was shown that an inventor obtained a patent relating to liquid fuel burners of the rotary wall flame type. The ignition and combustion take place around the outer periphery of the hearth adjacent to the wall of combustion furnace. The improvement was accomplished by substituting metal for ceramic material and making some adjustments of parts.

While the invention was practical and valuable the testimony showed that some of the features of the invention were disclosed in different prior patents. In other words, the inventor merely combined old and well known parts into a single invention. Therefore, the higher court held the patent void. The Court said:

"At most the claimed invention is merely the improvement of one element of an old combination the construction and operation of which are otherwise unchanged, ..."

Jury Decides Amount of Damages

Where a contractor breaches a contract for installation of heating equipment, and real property is damaged as a result of the defective installation, a jury may consider all testimony and render a damage verdict.

For example, in Siegel v. Struble Bros., Inc., 28 Atl. (2d) 352, it was shown that a house owner bought a heating system, consisting of a furnace, a humidifier and an air conditioning unit from a seller. By the terms of the contract the seller agreed to supply the equipment and to install it in the house. There were no defects in design or materials and the various units of the system complied with standard engineering practices. The system would have operated in harmony if it had been properly installed. However, the humidifier pan, intended to be level, was set up in a tilted position with the water level at the lower end below the overflow pipe. The result was a constant dripping of water to the hot interior of the furnace, and with the pan in this position the automatic control of the water supply could not operate. As a consequence, excess steam and moisture were discharged into the house, which caused a buckling of the wood floors, cracking of the plaster and breaking of the bond, loosening of the wallpaper, and warping of the woodwork. The defective installation was concealed by the outer shell of the furnace and for that reason was not observed by the owner.

In a subsequent suit the house owner had several building contractors to testify as to the cost of restoring the house to its former condition. Their estimates ranged from $975 to $1,225. The jury held the seller liable to the property owner in the sum of $700. The higher court approved the verdict, saying:

"The testimony as to damages, in reality, rests upon little more than opinion evidence as to what it would cost to restore the house to its former condition; the weight of it was for the jury."

Sales Agent Taxed

Generally speaking, the higher courts will not approve city ordinances which tax interstate business. However, either a city or state may require a sales agent to pay tax for doing business within the state.

For illustration, in Pelouze v. City of Richmond, 33 S. E. (2d) 767, reported June, 1945, it was shown that the City of Richmond (Va.) passed an ordinance requiring all persons, firms or corporations engaged in business as sales agents or agencies to pay a license fee of $50 00, plus one-half of one percentum of the gross earnings, receipts, fees, or commissions.

A manufacturers' representative named Pelouze was exclusive sales agent in the City of Richmond for various appliances used in the heating of buildings. Pelouze refused to pay the city an annual license tax on the grounds that he transacted *interstate* business. He proved that all orders and contracts for heating equipment were sent directly to the manufacturer located in another state. The manufacturer either confirmed or rejected the orders. If the orders were accepted by the manufacturer the equipment was shipped directly from the factory to the purchasers in the City of Richmond. The invoices, the collections and other incidents connected with each transaction were handled entirely by the manufacturer. Pelouze was paid a commission by the manufacturer at regular intervals. He maintained his own office in the City of Richmond, at his own expense. He carried no materials or stock on hand, and made no deliveries.

Notwithstanding these facts, the higher court held that Pelouze must pay the city license tax. The court said:

"The States have a right to require interstate commerce to bear its fair share of the cost of local government, notwithstanding the fact that the exercise of such right may, in some measure, affect the commerce or increase the cost of business."

Another higher court recently held that a heating contractor is a "retail" purchaser and must pay state's sales tax.

See Volk v. Evatt, 52 N. E. (2d) 338. It was shown that a heating contractor purchased various parts which he assembled into heating systems and plants. In other words, the sole purpose of the heating contractor was to manufacture and install completed furnaces in dwelling houses in conformity with his contracts with general contractors.

The court held that he must pay the state's sales tax, because sales to him were "retail" sales. The court said:

"He resold at retail none of the individual materials he purchased, since all of them were used in the process of manufacturing and assembling. . . . Hence, the purchase of manufacturing materials constituted a retail sale to him."

Heating Plant Important

Recently, a modern higher court in effect held that the heating plant of a newly constructed building should be in operative condition *before* the rooms are plastered or the contractor is liable for resultant damage.

For example, in Millimet Const. Company, Inc. v. Town of Bloomfield, 30 Atl. (2d) 292, it was shown that a school construction contract provided for completion of the building in 270 days and extension of time if the work was delayed without fault of the contractor. The contractor agreed to furnish heat necessary for drying the plaster. The contractor was given an extension and did not plaster the building within the specified 270 days, because the work was delayed due to a strike. The contractor failed to furnish heat from the newly installed heating system to dry the plaster. The result was that the plaster was defective. The school board refused to pay the balance due the contractor who filed suit. However, the higher court refused to hold the contractor entitled to a recovery and stated that

he should have had the heating plant in operating condition before starting the plaster work.

Interpretation of Contracts

The matter of interpretation of clauses in contracts between manufacturers and distributors is, of course, important. In all cases the higher courts consistently hold that when construing a contract the intended meaning of the contracting parties is of most importance. Moreover, the words of written contracts always are referred to by the court when determining the legal rights of the parties.

For example, in General Utilities Corporation v. Petrol Corporation, 38 Atl. (2d) 71, it was shown that a corporation made a contract with an oil company for purchase of fuel oil at a stated price. Later, on August 27, a supplemental agreement was made which provided that prices to the corporation should be as "hereinafter provided and not as set forth" in the original agreement.

In a subsequent suit the higher court allowed the seller a judgment for $20,641 based upon the prices in the supplemental agreement. This court said:

"So far as the price to be charged is concerned, the agreement of August 27, and no other contract, defined the price."

Res Ipsa Loquitur

Generally speaking, a consumer who suffers injuries from inhaling escaped gas from a heating system cannot recover damages from the gas company unless he proves that the gas escaped as a result of negligence of the gas company officials or employes. However, a modern higher court has held that if the injurious gas escaped from an appliance sold and installed by the gas company the consumer need only prove that escape would not ordinarily have occurred if due care had been used by the gas company employes, and that then the burden shifts to the company to show freedom from negligence.

For illustration, in Hanson v. City Light Company, 178 S. W. (2d) 804, reported February, 1944, it was shown that a consumer sued a gas company and sought recovery of damages for alleged injuries to her health said to have been caused by the carelessness and negligence of the gas company employes in the installation of a gas furnace in her home, together with pipes and appliances connected thereto.

Since the gas company failed to introduce testimony proving that its employes had *not* negligently installed the gas furnace and appliances, the higher court held the company liable for $1,750 damages.

Therefore, in cases of this nature, the employes of a company which installed the appliances should have at hand written notes and records which may be introduced during a trial to convince the jury that when the appliances and gas connections were *finally inspected* all gas leaks positively had been eliminated. Then, under these circumstances, the burden automatically shifts to the user who must *prove* that the seller's employes negligently installed the heating appliance. Failure of the consumer to prove these facts entitles the selling company to a favorable verdict.

Many returning veterans will be calling on readers of HEATING AND VENTILATING for counsel regarding a possible future in the air conditioning industry. Concise, generalized information not readily available elsewhere is presented, beginning on the next page, with the unconventional objective of informing veterans among our readers' inquirers rather than our readers themselves. As a bird's eye view of the industry, it is neither technical nor comprehensive; in fact, in the interest of simplicity, many qualifications and exceptions have been omitted. Individual copies of the section are available without charge.

Evaporative Cooling for Arizona Plane Plant

The largest evaporative pad cooling system in the world is making it possible to maintain modification schedules at the Tucson (Arizona) Division of Consolidated Vultee Aircraft Corporation as the hot sun beats down on the southwestern desert.

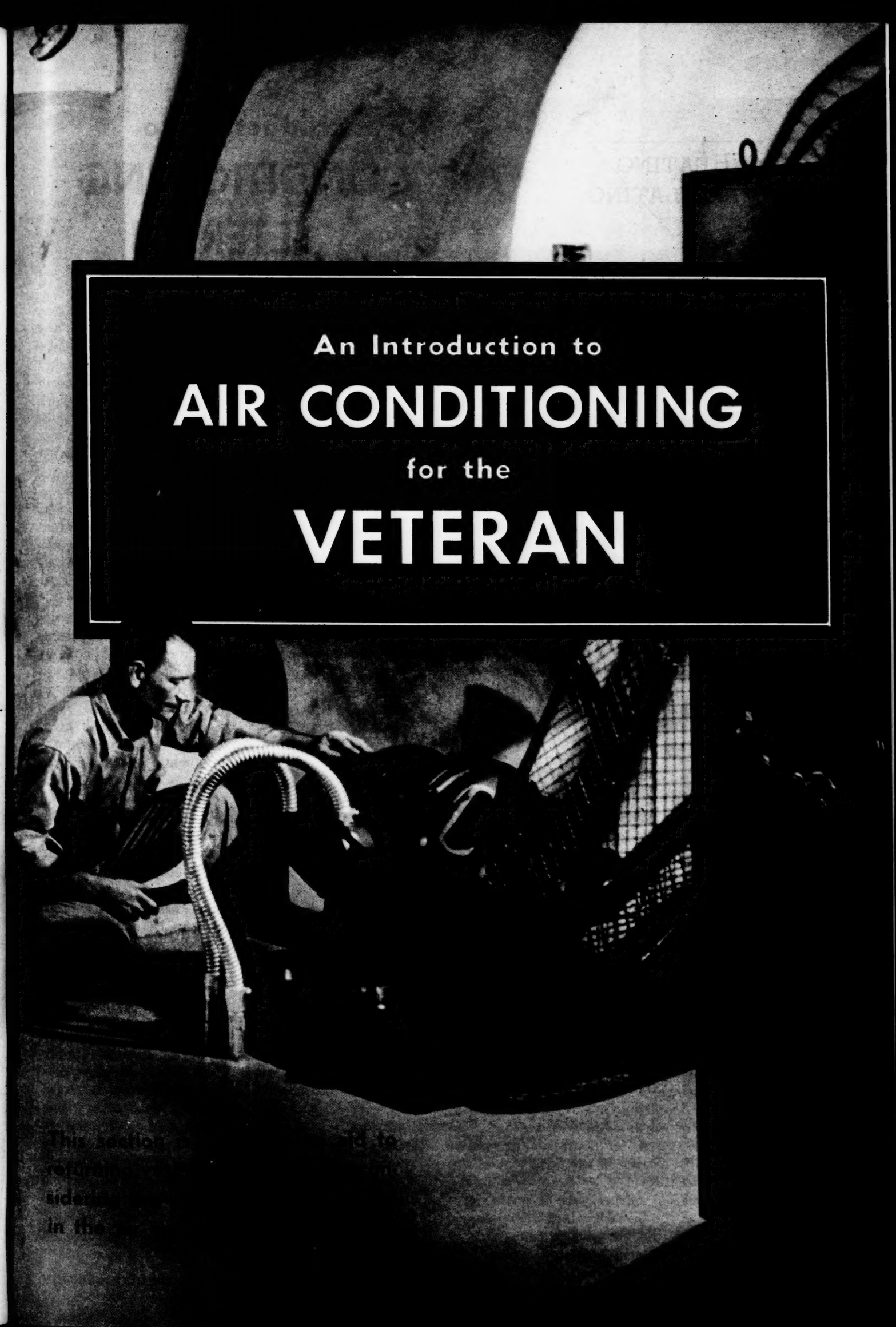
The blowers at Convair supply 2,947,760 cfm cubic feet of cold air into the three 700-foot aircraft hangars, making possible a change of air every eight minutes in the hangars proper and every four minutes in the office areas.

Seventy-two fans ranging from 22,700 to 57,180 cfm capacity, draw the hot, dry air through large dampened excelsior pads which cool the air. Fifty-four ¼ hp pumps circulate water through the pads. The total pad area required for system is 19,000 square feet.

Four tons of aspen excelsior are required each summer to keep the system in operation. This includes the periodic replacement of pads in each of the fan houses. The pads are three inches thick.

It has been possible to keep the plane hangars at 85F during the hottest summer months when the outside temperature was over the 100F mark.

The system is also being employed on individual B-24 Liberators upon which work must be accomplished out-of-doors. Individual evaporative coolers are attached to the plane through the tunnel hatch, located beneath the waist of the plane.



An Introduction to

AIR CONDITIONING

for the

VETERAN

HEATING AND VENTILATING

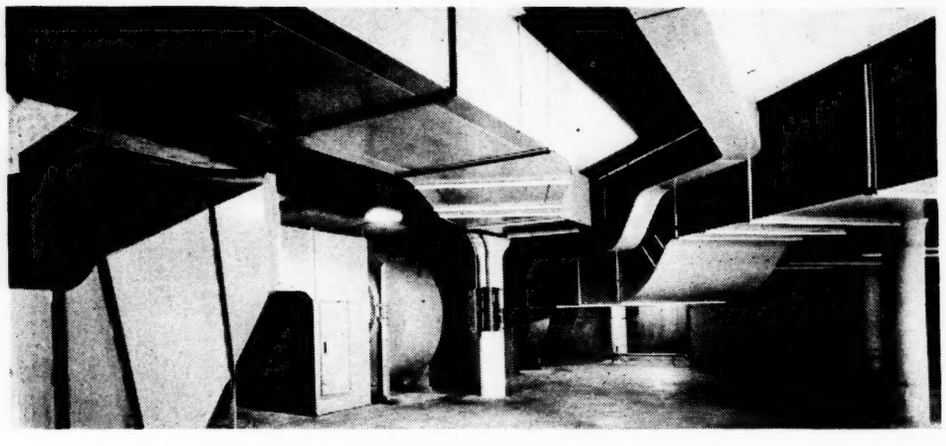
An Introduction to AIR CONDITIONING for the VETERAN

AIR conditioning is the control of the temperature, humidity, cleanliness and circulation of air. This implies the ability to heat and cool the air, add or take away moisture (humidification and dehumidification), extract dirt, fumes, odors, and even bacteria from the air and, by fans or other apparatus, move the air as required to obtain proper distribution and removal of the air.

Consequently, from the foregoing definition it can be seen that air conditioning is not a new art. It is a combination of old and well-known processes into an automatic and carefully controlled whole.

The component functions embraced by air conditioning include the following:

Heating. Heating by itself is not air conditioning but the heating of air is part of air conditioning. This heating can be accomplished in a number of ways. Common methods are (a) by circulating air over a hot surface heated directly by a flame, thence through ducts to the space to be heated; (b) by circulating steam or hot water from a boiler through pipes to radiators in a room; and (c) by circulating air over surfaces heated by steam or hot water, then distributing the heated air through ducts to the space being heated.



Fan room in the basement of a Buick factory.

Warm Air Heating. The first method mentioned under (a) in the foregoing is commonly known as warm air heating or warm air furnace heating. This is a very popular system for houses. The furnace or heater is usually located in the basement and is either fired by coal thrown in by hand, by a stoker, an oil burner, or a gas burner. Air is passed over the heated plates of the furnace, which is so designed that the gases from the fire do not come directly in contact with the air to be heated; the heated air either is allowed to circulate to the rooms by gravity or is moved by a fan and the cool air from the room is brought back and is reheated by the furnace so that a continual circulation of the air takes place. Such systems are installed by men skilled in sheet metal work, due to the amount of ductwork involved.

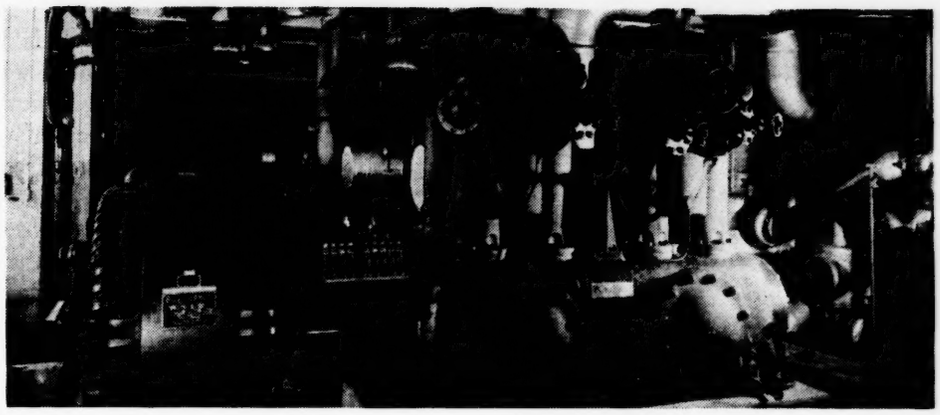
Radiator Heat. The method listed as (b) is known as radiator heating. A boiler, usually located in the basement heats water to some point under the boiling point, in which case the system is known as a hot water system, or above the boiling point, in which case steam is generated and the system is known as a steam heating system. The hot water or steam is circulated through pipes to radiators in the room to be heated. Here the steam is condensed or the hot water is cooled and the condensed water or cooled water is drained back to the boiler and is reheated. The boiler can be fired by coal, stokers, oil burners, or gas burners. Pipes are used to connect the radiators and the boiler. Such systems are installed by men skilled in steamfitting.

In larger buildings a combination of the two methods is frequently used. Here steam or hot water is circulated to large banks of metal tubes or heat exchangers where it gives up its heat to air which is blown over the tubes by a fan, and the heated air is then directed through ducts into the room to be heated. The cooler air is returned again to be reheated. This is variously known as an indirect heating system, a hot blast system, or, when combined with cooling, as a central air conditioning system.

Cooling. Air is cooled by being passed over tubes which are chilled. The tubes are usually kept cool by a flow of chilled liquid which, in turn, is cooled by some form of refrigeration—in most cases a mechanical refrigerating machine. An exception to this is the use of cold water from wells, a quite desirable method where cold well water is privately available. Mechanical refrigeration is an art in itself, and skill is necessary properly to install and service refrigeration systems.

Humidification. In many cases, particularly in the winter, the humidity or moisture content of air

is so low that the air is uncomfortable or, in the case of some industrial plants, the process is not efficiently carried out. In such cases it is necessary to add moisture to the air and this process is called humidification. Textile mills are particularly good examples of buildings where it is desirable to humidify the air. Humidification is done either by passing air through sprays of water, by introducing jets of steam into the air, or by mechanically atomizing the air.



Giant compressors for air conditioning the du Pont building.

Dehumidification. Where the air is too moist for comfort, or for the efficient carrying on of industrial processes, moisture must be removed from the air. This is known as dehumidification. Many substances (such as certain pharmaceutical products) absorb moisture and become difficult to handle if the air is too humid. It then becomes desirable to remove the moisture from air in plants manufacturing such products. This can be done in several ways. Two common methods are (1) to cool the air to such an extent that moisture present in the air is condensed out, just as it condenses on an ice-cold pitcher, and (2) to pass the air over substances which absorb the moisture. In the latter case, after these absorbing substances become saturated with water, the water can be driven out of them, after which the moisture-laden air is ejected to the outside. In case (1), air is chilled so that it rejects the moisture, the air may be at too low a temperature to be introduced to the room. It then becomes necessary for the air to be reheated.

Air Cleaning. Especially in towns and cities, air is contaminated by particles of dirt from smoke stacks, human beings, animals, and other sources; by odors from cooking, industrial processes and human beings; by fumes from furnaces and industrial processes; by bacteria from decayed matter; and by exhalations from lungs of human beings, animals, and other sources.

Dirt in the air can be removed by passing the air through filters which attract and hold the dirt and which themselves must be cleaned or replaced at intervals; or dirt can be removed by passing the air over electrically-charged plates which electrically attract the particles. Such treatments do not remove odors. To accomplish this the air must be passed through other devices especially designed for this purpose. Bacteria of some types are removed by ultra-violet rays.

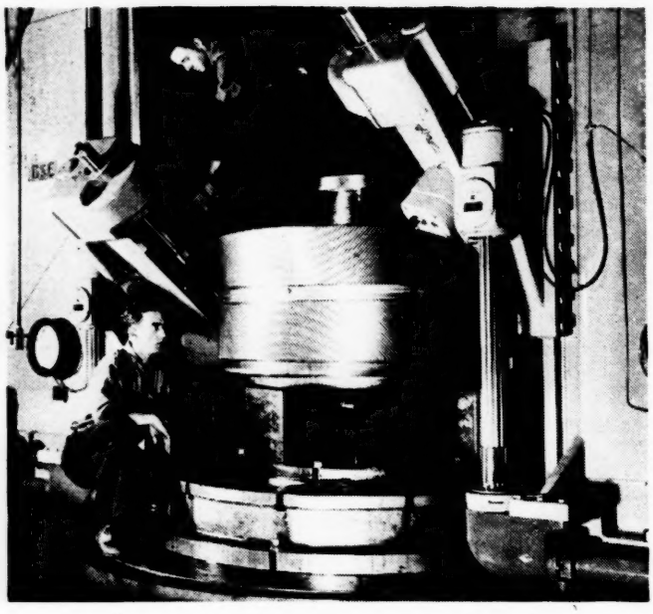
Air Circulation. To force air which has been heated, humidified, dehumidified, cooled and cleaned to the room or space where it is needed, and to exhaust the dirty or otherwise undesirable air from that room, fans are needed. Generally, at least one fan is used in every modern heating or air conditioning system, and frequently many fans are used.

Air conditioning can be classified in many different ways. One is by arrangement of equipment into (1) unit type and (2) central station systems. The former is frequently self-contained and may perform only one function. One example of *unit equipment* is a room space heater which is nothing more than a modern type stove, and which is complete in one room without any connections. Another example is a room cooler, a refrigerating machine for cooling the air and which is complete in itself in one room excepting for an electrical connection to drive a fan which forces the air over the cooling surface and through a filter. These two devices, room coolers and room heaters, are packaged products and can be sold in an appliance store as is an electric refrigerator, radio, or washing machine.

Central station systems are those where the machinery is centrally located at one point when the air is conditioned. From here the conditioned air is distributed through ducts to the various rooms or spaces in the building. These systems all differ one from another in important respects due to local conditions and, consequently, must be individually designed and installed by men who specialize in this work. From the foregoing it can be seen that an air conditioning system consists of all or a number of the following items: A boiler or heater, a refrigerating machine, sprays or heat transfer surfaces, filters, pumps, and fans with necessary motors, and connected by suitable ductwork or piping.

History. Air conditioning has a history of over 30 years. Among the early installations were a lithographing plant and a large public room in a hotel. The former type of job, known as an *industrial* process installation, differs from the latter, a *comfort* job, in that the former is carried out to facilitate the production of some manufactured goods, while the objective of the latter is to make people comfortable. Most of the earlier jobs were industrial installations and it was not until after World War I that comfort air conditioning became prominent, particularly in the larger theaters.

Within a few years after air conditioning was applied to theaters it was introduced rapidly into other businesses where the comfort of customers or clients was a matter of concern to the business owners. Restaurants are a particularly good example of logical use of air conditioning. Here it has been to the owners' profit to install air conditioning because in a cool and comfortable atmosphere the customers' appetite is considerably greater than



Watchlike precision in cutting Westinghouse gear requires constant day and night temperature and humidity.

in a hot and humid establishment. The result is that the patron orders more food.

One of the interesting points about air conditioning is that once an establishment of a given type has installed air conditioning, his competitors in the same locality are almost forced to install it in order to protect their business during the warm months. Consequently, through the late nineteen twenties and throughout the thirties, commercial establishments increasingly adopted air conditioning for such places as banks, barber and beauty shops, funeral homes, hotels, offices, theaters, restaurants, department stores, drug stores, and many other retail outlets. All types of air conditioning equipment have been represented in these establishments ranging from very large, involved, and costly central station installations such as that in the Statler Hotel in Washington, to the small self-contained unit type air conditioner in a small town beauty shop.

In the meantime, use of air conditioning in the industrial process field was slowly but steadily increasing. In these cases the installation was not made for the comfort of the employees or of customers but because the production being handled in the plant was of such a nature that it was desirable to adopt air conditioning. Industries which have put air conditioning to use include every major category of industrial plant, each with widely different reasons why air conditioning is profitable. In printing and lithographing plants, a variation in the day to day humidity causes paper to vary in size and this results in a difference in "register" of the printing, especially where the printing involves several colors. If air conditioning is installed, the humidity can be kept at a constant point, the paper will remain the same size, and the various colored inks will all be in perfect register—that is, exact relative position. Spoiled work is practically eliminated. The textile industry, as has been mentioned, is a very large user of air conditioning both in the manufacture of synthetic threads such as nylon and rayon as well as in the plants where fabrics are woven from these threads. High humidity is necessary in many textile plants to prevent a considerable breaking of natural or synthetic threads. In high precision machine shops where extremely accurate gauges and dies are made, accurate to as little as a millionth of an inch, variation in size of a given piece of metal due to the natural variation in temperature from day to day would be such as to throw measurements considerably out of balance. Consequently, highly accurate tool and die shops are more and more being air conditioned so as to maintain a constant temperature at which all measurements are made. Further, the maintenance of a low humidity in such spaces prevents highly polished metal surfaces from corroding.

In many industrial plants dust constitutes a very great hazard to the industrial processes; examples of these are optical plants and photographic film manufacturing establishments. In the latter case, particularly for small size film, the slightest amount of lint or dust is fatal to the process. Filters are employed to remove all possible dirt. The film itself is maintained at a constant temperature which experience has indicated is the best for its processing; this implies heating air in winter and cooling it in the summer so that air conditioning in all of its phases is employed. Candy factories are large users of air conditioning for, as everyone knows, candy becomes sticky, unmanageable and unsalable when the temperature is high. In manufacturing the candy, refrigeration is employed in such processes as enrobing the creams with chocolate. After the cream is dipped in the melted chocolate, it would take considerable time to dry unaided, whereas with refrigeration the chocolate sets quickly. There are numerous other industrial and commercial applications for air conditioning such as storage of furs, baking of bread, dehumidifying of the air supplied to blast furnaces, dehydration of foods, the manufacture of a wide line of chemical goods, and even the mass production of plate glass for automobiles. The number of possible applications for air conditioning were sharply increased during World War II.

Another interesting group of applications of air conditioning which have sharply grown during the past decade is the air conditioning of railroad cars, ships, and airplanes. These are specialized uses, however, and will not be considered here.

The Future of Air Conditioning

Inasmuch as air conditioning has such obvious advantages, and since as pointed out previously it is not new, the question might well be asked as to why air conditioning has not already been more widely adopted. There are two reasons why this has been the case. The first is that although air conditioning was possible, the actual accomplishment of it was a rather cumbersome and involved affair. It has taken years of experience to develop air conditioning to the point where it can be accom-

plished by relatively simple machinery. The second reason is associated with the first in that since air conditioning has been a rather involved engineering procedure, with each installation different from its predecessor, it was impossible, until not long before the war, for such equipment to be placed on a mass production basis. The result was that the cost of the equipment was so high that, when added to the installation cost, the total cost was too high to interest the larger segment of the population.

However, the development of unit air conditioners to a high degree of refinement made possible their mass production just before the war, and this type equipment may now be expected to sell in large numbers. On the central-station jobs, too, increasing simplification and standardization has made quantity production possible on the various parts of the system. Thus air conditioning costs will be reduced and the industry will enjoy far wider markets.

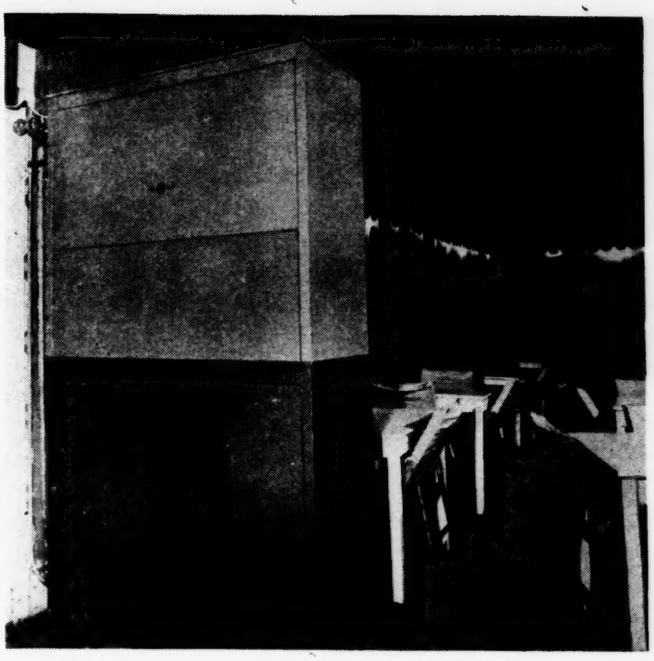
Although theaters are the largest single category (in terms of capacity) of commercial establishments in which air conditioning has been installed so far, even so only about 12½% of the total number of theaters are air conditioned. In the case of restaurants, less than 7% are air conditioned, while only 1.9% of the nation's drug stores so far have been conditioned. An estimate made by a leading air conditioning manufacturer is that the total industrial and commercial market is at the present time only 3% saturated, meaning that only 3% of the number of establishments involved have so far been air conditioned, leaving 97% still to be sold.

As a matter of fact, the degree of saturation in industrial plants is even lower than that in most of the commercial categories. Further, homes have as yet hardly been touched by air conditioning, and the home market is virtually virgin territory for air conditioning.

It is estimated that at the present time there are approximately 1½ million horsepower capacity in air conditioning installed and in operation in this country. This means that the motors connected to the air conditioning machinery total that number of horsepower. One estimate is that the total market for all types of cooling after the war is in the neighborhood of 47 million horsepower.

From still another source some data are available on unit room coolers. Sales of these almost doubled from 1939 to 1941 when sales were in the neighborhood of 30,000 units. It is anticipated that in 1946 about 70,000 of these units will be sold and at least one authority estimates 125,000 sales for 1947. These are for room coolers only.

A Wall Street investment house, during the spring of 1945, made an exhaustive study of air conditioning for evaluating the industry as an investment for capital. The study concluded with an estimate that for every $100 spent during 1942 for air conditioning a reasonable expectation might be that $130 would be spent in 1946, $165 during 1947, $215 in 1948, $240 in 1949, and $275 in 1950. In other words, there would be 2¾ times as much money spent for air conditioning five years from now as



Chrysler unit conditioner in Houston Stage Door Canteen.

was spent during the last year when air conditioning was available for sale to the public.

How Air Conditioning is Sold

The field of air conditioning embraces a wide range of talents and a rather broad range of businesses. The method of distribution of air conditioning equipment from the manufacturer to the ultimate buyer is somewhat complex, especially where central station equipment is involved. Unit equipment on the other hand follows a somewhat simpler line.

Unit equipment, such as room coolers, requires no elaborate installation; consequently, little mechanical skill is involved here. The manufacturer usually sells them to distributors or wholesalers who, in turn, sell them to dealers who maintain showrooms and sell them directly to the ultimate buyer.

On the other hand, central station equipment, since tailor-made installations are involved, is rather more complicated. In such cases no one manufacturer makes all of the goods which go into a system, but the system is made up of an assembly of equipment purchased from a variety of sources. First, however, the system must be designed, and this is usually done in an engineering or architectural office which prepares plans and specifications. These are then placed out for bid and the bidder to whom the contract is awarded purchases the specified equipment from manufacturers and wholesalers. The bidder is termed a contractor and he in turn employs engineers to supervise the installation, the necessary artisans in the way of steamfitters and sheet metal workers to fabricate, assemble and install the necessary equipment, salesmen to bring in contracts, and the necessary clerical help. In many cases a dealer who has a franchise for selling a certain manufacturer's line of air conditioning equip-

ment sublets the actual installation to a contractor.

After the system is installed it may be under the direction of an operating engineer, depending on the size and complexity of the installation.

Troubles originating with air conditioning systems are taken care of in a variety of ways. If the system has an operating engineer he may service it, or the contractor who installed it may have a service department to handle such work for a fee; in still other cases business organizations doing nothing but servicing are responsible for this work.

The men who own and run such organizations as distributors, dealers, contractors, appliance stores and service organizations are business men in every sense of the word, usually with a background of experience in air conditioning, heating and refrigeration. Engineers, draftsmen and estimators are employed, not only by the manufacturer of the various air conditioning apparatus (in which case they are skilled machine designers with a special knowledge of air conditioning), but also by contractors, dealers, and even in some cases by service organizations.

Salesmen are employed by the manufacturer to sell his equipment to dealers and to contractors and by dealers and contractors to sell their services and goods to building owners and others.

Mechanics, in most cases, are one of three different types: (1) men experienced in handling sheet metal, who can fabricate and erect sheet metal ducts for the distribution of air to the various rooms; (2) steam fitters who are skilled at assembling pipe for the carrying of steam, hot water, refrigerants, cold water, brine and so on, connected to the various conditioning apparatus; (3) the service men who can repair condensing units, compressors and other devices when they get out of order or otherwise need attention. To a somewhat lesser extent skilled electrical men are needed for repairing motors, controls and other electrical apparatus.

To sum up, then, the business of air conditioning, which has such a favorable outlook for expanding, will require salesmen, engineers, business men, and mechanics. Depending on his individual talents, education, and experience, the veteran may find an opening with one or more of the organizations discussed in the following.

Manufacturers

Manufacturers are a fine source of leads for positions in addition to being employers themselves. They employ engineers, salesmen and mechanics, and besides, due to their wide contacts with the field, they frequently know of openings with their dealers and distributors.

Many of the large manufacturers have their own schools to train employees in the fundamentals of air conditioning and in production methods. Applicants must show that they have mechanical aptitude. Even though one lacks an extensive mechanical background, the schooling given some men in the armed services in mechanical repair work and installations should be recognized. Personnel men rely upon the mechanical aptitude tests used by the Army to select candidates for production work. Manufacturers have need for many skills and mechanical training. Multiplying the number of plants in the industry by the mechanical tasks required, one can obtain a fair concept of the opportunities open in production.

Distributors and Dealers

There is frequently no direct contact between the manufacturer and the customer. Instead, makers of air conditioning equipment establish distributors or dealers, the former being a wholesaler or jobber, the latter a retail outlet. Men who have a good background in air conditioning and who feel that they have proper qualifications should write to the personnel departments of manufacturers.

A distributor or factory representative has an important task. He is responsible for obtaining a large share of the possible business from his territory for the company he represents. He may do this by developing an extensive dealer organization or he may share his territory with others who will be responsible to him, in which case he is a distributor-dealer. Since the distributor will supervise the sales efforts of others, he must have sufficient mechanical knowledge to establish an efficient installation and service division for his territory.

Many of the air conditioning units that will be sold will be "packaged units." You have seen them in drug stores, bakeries and other neighborhood stores. Within the metal cabinet are housed all the equipment that is necessary for the proper functioning of the unit. Once the unit is sold and delivered, all that is required is an electrical outlet to which the unit can be connected.

For that reason, air conditioning units of this type will be sold through the home appliance dealer who also sells such units as washing machines, vacuum cleaners, and domestic refrigerators. The appliance dealer is the basis of the selling structure that serves the manufacturer on these products and he falls into the group that the government has termed the small business man.

As a group the small business man has had more business failures than any other—jobber, wholesaler, manufacturer. This is not surprising. Most men who have the advantage of a small amount of savings, or who perhaps have financial assistance from the family, believe that they have the proper requisites for entering business.

There are so many pitfalls that the causes of failure should be of interest. They are:

1. Lack of experience. Any one who attempts to enter a field for which he lacks experience is inviting serious trouble.

2. Lack of finances. Unfortunately sales are not made as soon as one announces to the community that he is ready to do business. Funds are required for the purchase of stock, store fixtures, tools; funds are needed to meet the store rental until sales are sufficient to cover this, and there must be some-

thing both for the small payroll required and for the owner's living expenses while he is getting his business established.

3. Lack of business training and judgment.

4. Personality. Serving the public is at times trying. Unless one has patience, a pleasing manner, and enjoys meeting people, trouble will result.

5. Store location. Stores on side streets or in minor business areas are rented at rates lower than those on main business thoroughfares. The price for the lower rent is less potential sales and a diminished advertising value from the location.

For one who has the inherent qualifications to become a dealer, the next problem is how to get established. While each manufacturer has his own individual sales structure and outlets, in general it can be said that dependence is placed on distributor or dealer agencies. Distributors often find that their area is too large to be properly handled from one central point. Therefore, a distributor would welcome a competent home appliance dealer for a section difficult for him to serve or too far from his home office. A home appliance dealer, besides providing a suitable sales outlet for the distributor, would be required to service the equipment that he sells. This requires the appliance dealer to have the full or part time services of a service man.

As a sales outlet for the distributor, he would have the business advice and guidance of a seasoned appliance man. Besides assistance from the distributor's staff, he can rely upon manufacturers' sales promotion material and advertising campaigns. But he may have to prove financial stability and the proper qualifications for starting such a business.

However, even though you may not qualify or even be interested in becoming a dealer, you may want to look for a dealer as an employer. He is an employer of engineers and salesmen, estimators and, frequently, mechanics.

Contractors

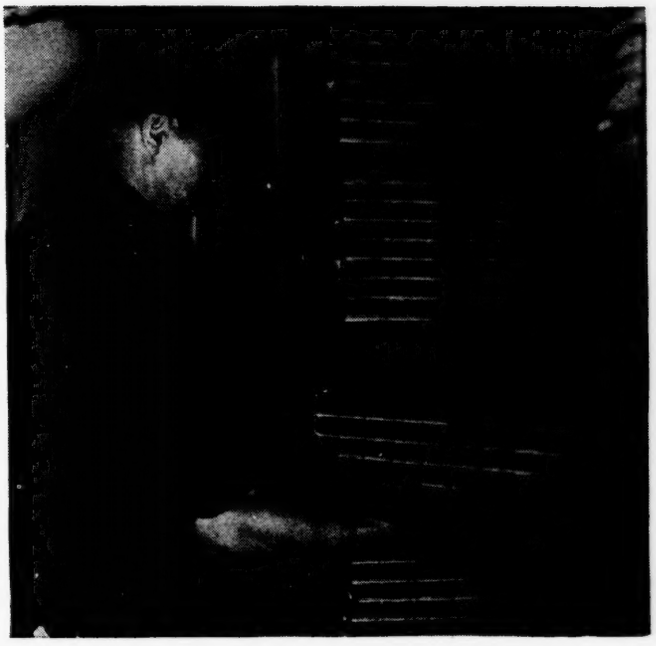
In addition to the sale of "package equipment," there is the sale and installation of central station systems previously mentioned. The systems are too large and complicated to be served economically by one or more packaged units. Such systems have to be designed for the particular job by men who specialize in this work, generally a consulting engineer or an engineer in an architect's office.

Contractors* often do not differ too much from dealers. Generally speaking, however, a contractor specializes in installation work, while the dealer is more a retail selling outlet.

Once the system has been designed, contractors are called in to present estimates of what they will charge to install the equipment called for by the engineer. Frequently the contractor is permitted some latitude in the engineer's design and therefore must have sufficient sales ability to convince a buyer which of several units should be installed.

The contractor must have broad experience and mature judgment. He must have a good understanding of labor and material costs, labor relations and engineering. Contracting companies require competent engineers, salesmen and mechanics.

*Contractors are variously known as heating contractors, air conditioning contractors, heating and plumbing contractors, ventilating contractors, heating and piping contractors, and sheet metal contractors.



Cleaning dry air filters in Ford plant.

Contractor–Dealer

It is possible to combine the functions of contractor and dealer, selling the special equipment required and installing the system. This would appeal to the engineer with extensive specialized training and experience. Only a limited number of engineers may find such opportunities.

All of the foregoing retail-installing organizations (contractors, dealers, dealer-contractors) are employers and may be sources of openings for salesmen, engineers or mechanics.

It may be well to differentiate here between salesmen and sales engineers employed by dealers and contractors. The sales engineer is called in on special jobs where a decision has to be made on the size and type of unit to be purchased, on special industrial problems where conditioned air is required to produce a special product or improve a manufacturing process, to compute the cooling load that must be met by some air conditioning system, or other technical problems. He has a good schooling in air conditioning engineering fundamentals in addition to three to five years experience with a manufacturer or other dealer in the field. While an engineering degree is an asset, it is possible to develop into this work through selling the small job and by continuing one's schooling after business hours. It is work requiring considerable judgment and experience.

The salesman develops customer contacts, expands sales possibilities and promotes the value of the product to the sales prospect. Like an automobile salesman, he is not necessarily a technical man. He knows enough about his product to make a good sales presentation but a lack of specific knowledge

of methods or design may not be detrimental. Besides tact and persistence, he must have an interest in human nature and he must believe in the product that he is selling. His work will require many contacts and after-hour calls. For that reason he should have mental stability and reserve and thoroughly enjoy working with others. Selling the packaged unit will require more sales ability but less technical knowledge than sales engineering. For systems that must be assembled on the job, the salesman must be grounded in sales engineering.

Servicing

All automatic mechanical equipment must have some servicing sooner or later due to the wearing of parts and mechanical adjustments. The service man is often someone who has obtained experience with some manufacturing organization, or who has combined the training received from a special vocational school course with actual experience in the field or shop. He may have received his experience with an appliance dealer or distributor. Such a background makes an excellent foundation upon which to build for a career as home appliance dealer, distributor or even to attain some minor executive position with a manufacturer. At present, there is a shortage of good service men, and there are opportunities for service men to establish their own business, as well as in working for others. Some dealers, particularly where time and travel are factors, may find it profitable to assign some of their service work to one who has proven capable.

He may also get a start through working for a service company—an organization specializing in the servicing of air conditioning equipment.

A young man desiring to enter business may find that through servicing he can get started in a shorter time than either through sales or engineering. With additional training he can develop the know-how of his mechanical training, and his personal contacts into available tools for sales work. Service men have become outstanding salesmen and also successful independent dealers.

Operation

All of the large central station units require an operating engineer. For the small size system the operating engineer may have other mechanical duties besides looking after the air conditioning system. For a medium size central system, the full time of an operating man may be required. An operating engineer, plus a number of assistants, is often necessary for the large central systems.

Many of the large cities require that the operating engineer in charge of systems larger than a stated size must have a city license to operate such plants. Candidates for the license are examined in plant operating practice and theory. Therefore the position presupposes some knowledge of air conditioning, experience in operating air conditioning equipment, and a deftness with tools.

Education and Training

In surveying the possibilities for the veteran in the air conditioning field, one basic fact stands out —that training and experience are necessary.

Schooling is essential. It may be in such concise form as that received in vocational or company schools, or it may be as comprehensive as a college course. At any rate, schooling is necessary.

College is recommended for the young man who has had from 3 to 3½ years of high school at the time of his induction into service. Colleges recognize the value of training in mature thinking provided while in the service, and may permit veterans to enroll for a regular college course without high school diploma, upon special examination. Those who have had one or two years of college training would be wise to complete their course, planning their studies to include courses helpful to an air conditioning engineer.

The veteran who wishes to examine the possibilities and advantages of further schooling should proceed with caution, with special guidance and advice if possible. The number of vocational counseling agencies is substantial in most communities and is growing rapidly. Use them—and use your common sense.

Here are some of the mistakes that are made too often by young men with an urge to "take a course": First is the lack of a clear cut idea of what the student wants the course to do for him. You don't need a degree in mechanical engineering to install a sheet metal duct—but you may need one to design that duct. If you want to be a consulting engineer, *and have the background to become one*, a diploma may be an asset. A "course" is not a magic wand projecting the graduate into the middle of a colorful career. A course is just a tool that helps a man to work at what he likes to do.

A second common error of earnest young men is in the choice of a school or in the selection of courses at an academic level for which they are not prepared. If you expect to operate at the skilled trade level—to be a service man or mechanic—and you think a course might help you, first ask someone in the business whether or not such a course will be of value and then go to a reputable trade school. Find out whether a large manufacturer of air conditioning equipment in your city has the training course you want. Beware of the fly-by-night schools that exploit popular trends in such careers as air conditioning, radar, television, etc., and give little for the tuition received.

Ask advice, but use your own judgment. Here are some organizations that can help you: Vocational Counseling Service of the U. S. Employment Service; YMCA, Catholic and Jewish veterans' services, Veterans' Administration, adult education councils, school principals, chambers of commerce, etc.

In addition to these, you will find that most men already engaged in air conditioning will be cooperative and will be only too glad to help you.

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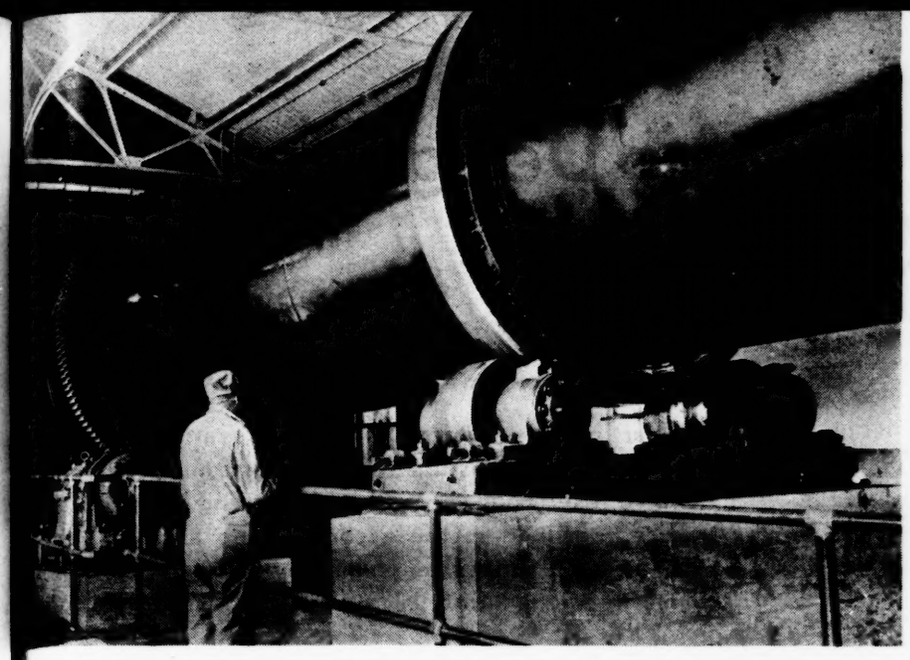
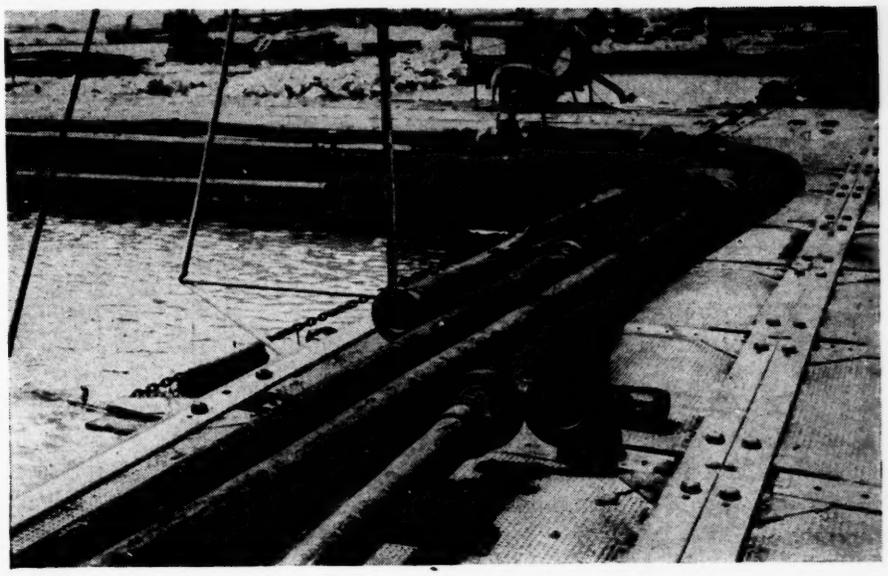
Picture Paragraphs



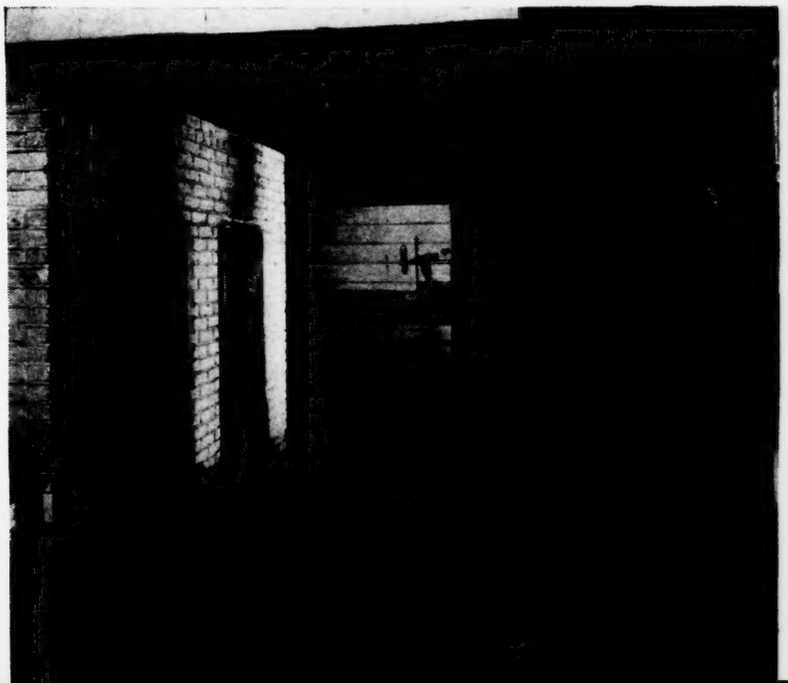
(Above) In making White Glove packaged fuel, anthracite and bituminous fines are separately dried in this 40-ft revolving cylinder. Warmed air at high speed removes all free moisture from fuel.

(Right) Petroleum Administration for War photo shows flexible pipe used in the Pacific campaign for quick ship to shore transfer of oil and gasoline.



(Below) A thread gauge smaller than a thumb nail is checked at the East Pittsburgh works of Westinghouse by this comparator. System of mirrors enlarges gauge contours 100 times. This and other delicate measuring instruments are housed in a special laboratory kept at constant temperature and humidity the year round, making possible tolerances as close as 2/1,000,000 of an inch in Precipitron cleaned air.

(Below) Iron Fireman stoker fires nut shells in the shelling plant of the Oregon Nut Growers, Inc. Large hopper handles quantities of walnut and filbert shells satisfactorily.



Forced Warm Air Design for a Small Hotel

P. A. CRONEY

Wartime experiences with forced warm air for the larger non-domestic and non-industrial installations have resulted in the author's adopting certain practices outlined in the accompanying article. Some of these practices are common, others are developments by the author, all are worthy of consideration.

FORCED warm air systems for installations other than house heating and industrial plant heating have suffered, in the writer's opinion, during the war due to improper planning—some of which was incidental to the severity of limitation orders on controls, some to over-rating of the furnaces—and to use of some substitutes for sheet metal in ducts which were not fire resistant in the range of temperatures encountered. The purpose of this article is to present some design data on a small hotel installation of forced warm air in which is incorporated an adequate arrangement of controls, to illustrate a suggested method of selecting the furnace size and otherwise to indicate what the writer believes to be good practice in forced warm air design for such systems.

Design

There are nine factors to be taken into consideration when designing a non-domestic forced warm air system:

1. A predetermined pressure drop throughout the system;
2. A furnace large enough to compensate for the heat loss of the building, without forcing;
3. A careful calculation of building heat losses;
4. A register temperature not greater than 135F;
5. A bonnet temperature not greater than 165F;
6. A return air temperature not lower than 65F;
7. Allowance for temperature drop from bonnet to registers;
8. Adequate controls; and
9. A system designed for the correct outside-inside temperature difference.

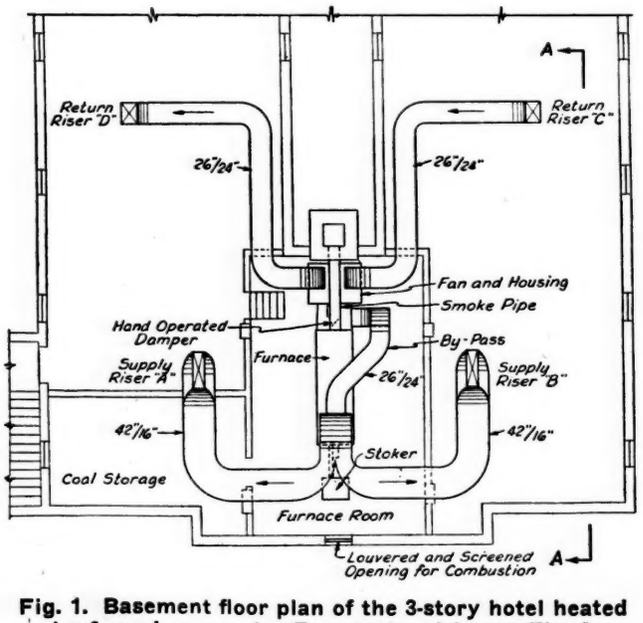


Fig. 1. Basement floor plan of the 3-story hotel heated by forced warm air. For section AA, see Fig. 3.

In regard to (9), if a system is designed for 0 to 70F it would be impossible to use this same design for —10F to 80 merely by increasing the temperature of the air without increasing the volume of the air. Calculation may show that this is permissible, but in actual use such a method is unsatisfactory. It has been tried on more than one job and in each instance major changes have been necessary to make the job function properly.

The layout shown in the accompanying drawings is for a small hotel in a 0F design temperature zone. In figuring the air quantities for each room, it was found that the temperature drop of the air from the furnace bonnet to the last register was so slight, due to the duct insulation, that the drop was ignored. In view of this, the heat loss for each room was multiplied by 0.0149 to give the cubic feet of air per minute with a 65F return air temperature and 135F register temperature.

Heat losses for the frame construction are as follows:

Walls

Outside surface film coefficient (f_o)	= .17
Y.P. lap siding	= .78
1 in. fir sheathing, building paper	= 1.16
Air space	= .91
½ in. rigid insulation board	= 1.52
½ in. plaster	= .15
Inside surface film coefficient (f_i)	= 0.61
Total	5.30

Overall coefficient U for 70F temperature difference $= \frac{1}{5.30} \times 70 = 13.3$ Btu per sq ft per hr.

First floor double, coefficient U for 30F temperature difference, .34 × 30 = 10.20 Btu per square foot per hour.

Roof Construction (No attic)

Outside film coefficient, f_o	= .17
Built-up roofing	= .28
¾ in. sheathing	= .93
Air space	= .76
¾ in. metal lath and plaster	= .20
Inside film coefficient, f_i	= .51
	2.85

TABLE 1.—RECOMMENDED OPERATING VELOCITIES AND TIP SPEEDS FOR MULTIBLADE VENTILATING FANS.

(Abstracted in part from the 1945 ASHVE *Guide)*

Static Pressure, Inches of Water	Forward Curved Blade Fans		Backward Tipped and Double Curved Blade Fans	
	Outlet Velocity, Feet per Minute	Tip Speed, Feet per Minute	Outlet Velocity, Feet per Minute	Tip Speed, Feet per Minute
¼	1000-1100	1520-1700	800-1100	2600-3100
½	1000-1200	1970-2150	900-1300	3400-4000
¾	1300-1500	2480-2700	1100-1650	4200-5000
⅞	1400-1700	2660-2910	1200-1750	4500-5300
1	1500-1800	2820-3120	1200-1900	4800-5750
1¼	1600-1900	3162-3450	1300-2100	5300-6350

Overall coefficient U for 70F temperature difference $= \frac{1}{2.85} \times 70 = 23.8$ Btu per sq ft per hr.

Infiltration

Rooms with window on one side,
room cubage × 1.3 = Btu per hour for 1 air change;

Rooms with windows on two sides,
room cubage × 1.9 = Btu per hour for 1½ air changes;

Rooms with windows on three sides,
room cubage × 2.3 = Btu per hour for 2 air changes;

Entrance halls, room cubage × 2.5 = Btu per hour for 2½ air changes.

Based on the foregoing constants the total heat loss amounts to 714,772 Btu per hour.

Furnace. Size of furnace to be based on a 20% heat loss from the air traveling from the bonnet to registers, and a 65% all-year-round efficiency:

$$\frac{\left(\frac{714{,}772}{.80}\right)}{.65} = \text{1,375,000 Btu per hour total output of furnace at bonnet.}$$

Use of certain Government formulas would result in selection of a furnace with a combustion rate of 10 lb of coal per square foot per hour with year-round efficiency of 70%. This would give a furnace too small, particularly so when the outside temperatures drop below zero.

The writer suggests selecting the furnace as follows:

The size to be such as to develop not less than 1,375,000 Btu per hr at the bonnet when burning not more than 7½ lb of 12,000 Btu coal per hour per square foot of grate when firing not oftener than once every ten hours, hand firing, even though the job is laid out for stoker firing.

Controls

A wartime limitation order placed on forced warm air heating system controls made allowance for (1) a bonnet control; (2) fan control (on-off operation); (3) high limit control in return duct; and (4) duct or room thermostat, sometimes allowed and sometimes disallowed. This combination gave intermitting operation and high over-riding temperatures.

The control system designed for this heating system involves continuous fan operation during normal daytime occupancy; automatic night shut-down with low limit protection; modulation of heat source over a wide range of demand, all with a design temperature of 0 to 70F.

Referring to Fig. 2 the system operates as follows: In normal operation the outside air controller T-1 will raise or lower the supply air temperature in accordance with a definite schedule necessary to maintain proper temperatures in the heated spaces. This is accomplished by resetting of controller T-3 in furnace bonnet and T-2 in fan discharge in accordance with outside temperature variations. Controller T-4, located in the return air duct, will operate in conjunction with the above instruments to reduce the supply air temperature whenever overheating within the space occurs. Such overheating might be caused by internal heat gains through lights, occupancy, and so on. In addition, T-4 will cause an increase in the supply air temperature whenever unusual demands on the system occur, such as during the warming up period in the morning.

At night a time clock will cut out the outside control system and minimum temperatures will then be maintained by intermittent operation of the fan and stoker through a room-type thermostat, T-5, centrally located. In this instance the first floor lobby has been chosen as the logical location for this thermostat. At some predetermined time in the morning the time clock restores the system to normal daytime operation.

T-1 is a remote bulb potentiometer controller. The sensitive bulb of this instrument should be located on the north exposure, avoiding, as nearly as possible, sun effects and other external influence. This controller should be adjusted between the range of 0-70F and will perform a dual function.

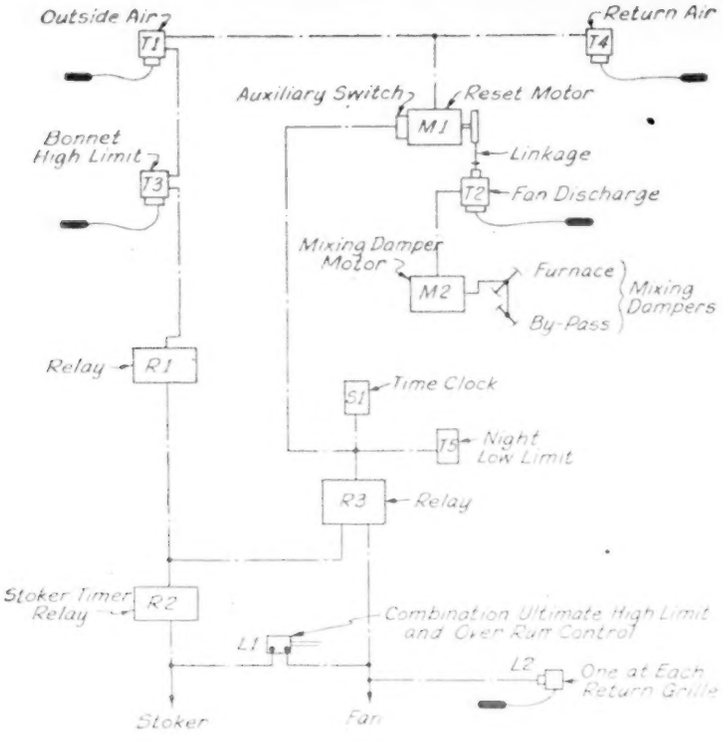


Fig. 2. Diagram of controls for the forced warm air system.

T-1 Temperature controller, 0-70F range
T-2 Temperature controller, 65-165F range
T-3 Temperature controller, 70-170F range
T-4 Temperature controller, 55-65F range
T-5 Night thermostat
M-1 Reset controller
M-2 Mixing damper motor
L-1 Combustion high limit control
L-2 Fire safety cut off set at 95F
R-1 Relay
R-2 Stoker relay
R-3 Relay
S-1 Day-night time switch

The first potentiometer is electrically connected to a modulating motor, M-1, which mechanically resets controller T-2 through a range of 65F to 165F. Motor M-1 resets controller T-2 by suitable linkage and cam assembly.

T-2 directly controls M-2 damper motor operating mixing dampers. These dampers have one set of louvers arranged across the face of the furnace outlet and a second set in the bypass air section, which is connected between fan discharge and the supply duct. By this arrangement, final discharge temperatures may be maintained or varied by the outside controller T-1.

The second potentiometer on T-1 will serve as a compensating device to change electrically the control point of a bonnet limit control T-3. The bonnet controller is to be located between the furnace section and the damper. This control will actuate relay R-1, which is interconnected with other safety devices and primary controllers to operate stoker motor through stoker relay R-2.

A day-night time switch S-1 will operate in series with an auxiliary switch on motor M-1 to control both the fan and stoker through relay R-3. Night thermostat T-5 will be connected in parallel with S-1 auxiliary switch. During the day, when outside temperature is below 65F, the fan will run continuously and the stoker will operate from outside controller as previously described. At night the fan and stoker will be operated intermittently from night low limit thermostat T-5. The night thermostat should not be set above 65F.

L-1 is a combination high limit safety control, located in the furnace bonnet, which will stop the stoker and operate the fan regardless of the demands of other controls. The face damper should be limited to provide for minimum flow to eliminate possibility of overheating in the bonnet.

The design as described treats the entire space as a single zone. However, by duplication of certain equipment and changes in duct work, additional zones might be added without complicating the fundamental concepts of the system.

With this system of controls and with stoker-fired equipment, the danger of overheating is greatly reduced because of the variable speed of the coal feed. In other words, at minimum low temperatures it would be advisable to operate the stoker at

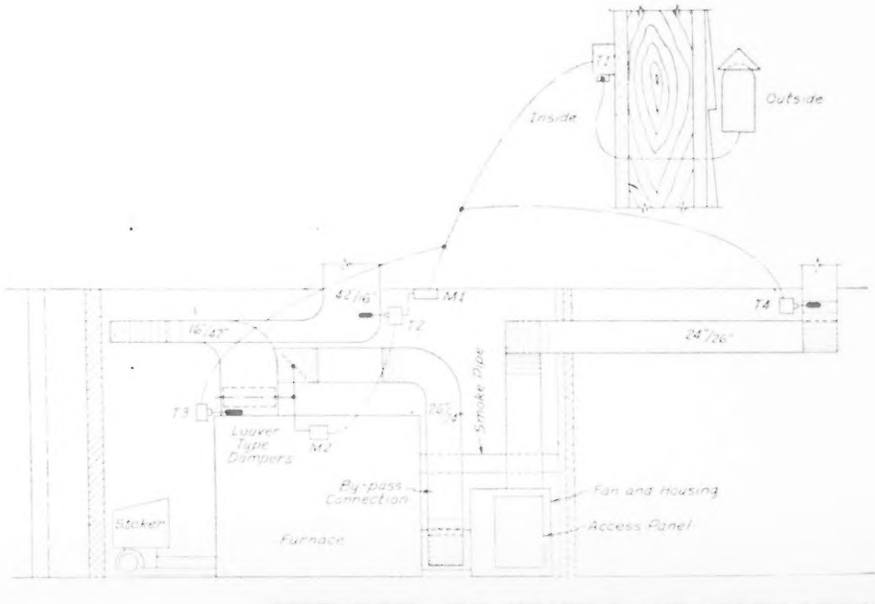


Fig. 3. Section AA, Fig. 1, with furnace room wall removed. Control symbols are defined in caption to Fig. 2.

maximum capacity, but in the Spring and Fall the speed of the coal feed can be reduced, since all stokers have arrangements for reducing the speed of the fuel feed to as low as 25%, with one or two intermediate speeds.

This system is submitted as a reasonable arrangement of controls for a forced warm air system where an inside thermostat would not be adequate. As far as the writer knows, this combination of controls has never been used on a forced warm air system.

Fan

The fan should always be located to discharge in the rear of the furnace, opposite the firing front. When using double inlet fans, they should be located in such a way that the same amount of resistance is present on both inlets. Otherwise the fan will operate in an unbalanced condition.

Loose fan belts are a contributing factor to a poorly operating system and cause no end of trouble. The writer has experienced motors being burned out due to belt slippage, because of lack of attention on the part of the maintenance force in not keeping the belts tight. To overcome this, set the motor in a frame that automatically takes up the slack after the fan has reached its full speed.

Fans on installations requiring more than 2000 cfm should be heavy duty type with backwardly curved blades. Recommended operating velocities and tip speeds of multiblade ventilating fans with backward tipped and double curved blades or forward curved blade fans are given in the current *Guide* from which Table 1 is abstracted.

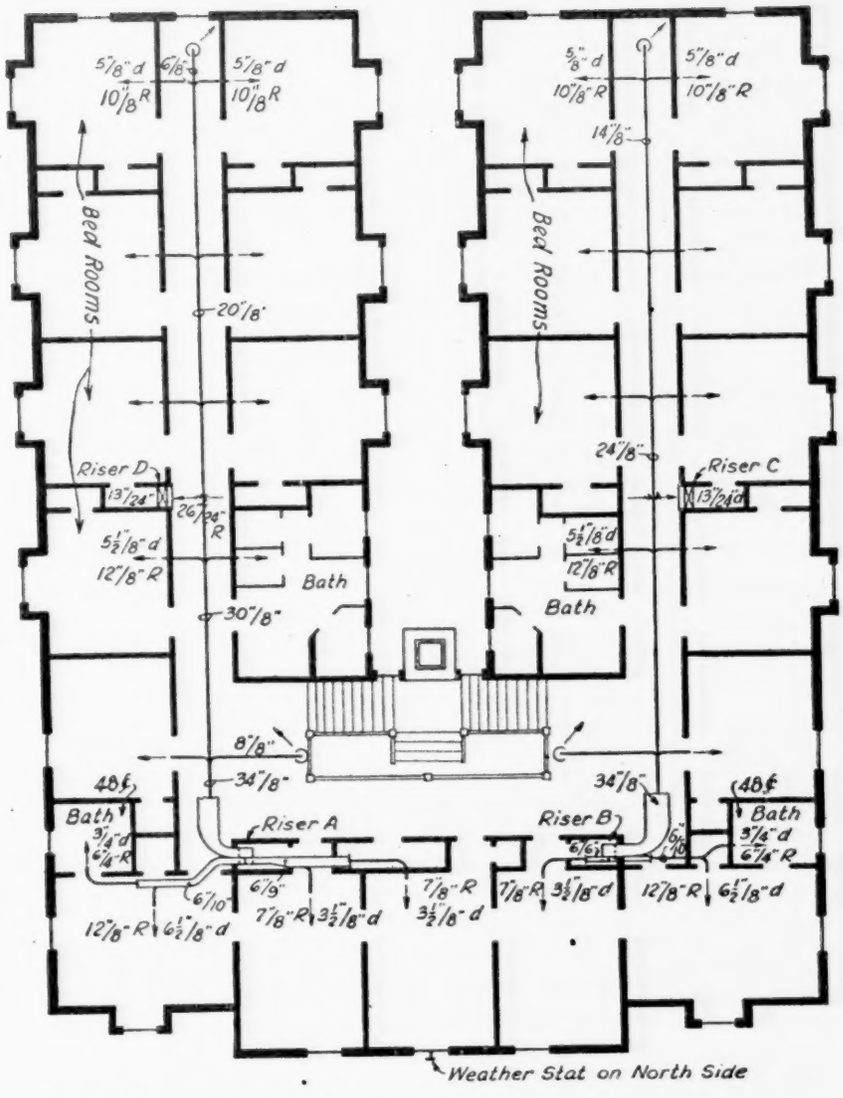


Fig. 4. Typical (third) floor plan of the hotel. Unless otherwise noted, all the bedrooms have 3½ x 8 in. supply ducts with 8 x 8 in. registers. All doors of heated rooms are cut 2 in. short to permit recirculated air to reach corridors and the two return risers.

The actual amount of air required to compensate for the heat loss for this project is 10,532 cfm, against a pressure of 0.824 in. of water. As it is absolutely impossible to set dampers to deliver the actual amount of air for each room, the writer always specifies an additional amount, depending on the size of the building to be heated. In this instance 5% should be added, giving a fan capable of delivering 11,058 cfm.

To the calculated pressure drop it is suggested that 10% be added to take care of unforeseen inaccuracies of design, so that instead of supplying a fan capable of delivering against the pressure of 0.824 inches this should be increased to 0.906 inches of water.

In selecting the fan, refer to Table 1 for backwardly curved blades and specify a fan that would deliver 11,058 cfm with an outlet velocity not in excess of 1,900 feet per minute and a tip speed not in excess of 5,750 feet per minute at the nearest larger pressure to that required or, in this case, 1 inch pressure.

The fan motor drive should have an adjustable pulley, so sized that by adjustment the above 11,058 cfm can be increased or decreased 10%, giving a total variation of 20%.

Ducts

Losses through the system were determined as follows and duct work was sized on a drop of 0.1 inch loss per 100 feet:

Losses through:	In. of Water
Duct work	0.350
Filters	0 250
Furnace	0.125
Registers	0.036
Return Grills	0.061
Dampers	0.032
Total	0.854

Noise

Since the building under consideration is of the small hotel type and consideration should be given to the amount of noise permissible when guests are

asleep, duct velocities should not be below 1000 fpm leaving the bonnet, and in many instances can go as high as 1500 fpm without undue noise.

Some sound deadening materials placed inside heat ducts are of a so-called fire-retardant or fire-resistant nature. These are chemically treated, and only fire-retardant or fire-resistant as long as the temperature is below 150F. When the temperature rises above 150F the chemicals used are dissipated and the material becomes inflammable. In many cases fires have started in warm air ducts where warm air furnaces are used with simple on and off controls, particularly when burning soft coal, hand-fired, and where high temperatures are created due to over-riding when rooms are satisfied and the fan shuts down. Consequently, sound deadening materials of the nature described are not to be recommended.

Use of an isolation material under the fan and the motor base is a desirable protection against noise.

Fire Protection

Some authorities on forced warm air heating are in favor of a damper in the returns as a fire pre-preventive measure. In this layout a fan safety cut-off with a range of 40F to 125F has been used in each return grille in place of fire dampers. This is a manual reset instrument and should be set at about 90F. Location of the instrument should be back of the return grille so that it will be unnoticed by occupants but can be reached through the grille face with screw driver for resetting. This fan safety cut-off is designed to stop the fan operation whenever the temperature at the return grille reaches the predetermined setting (90F) and must be reset manually to resume operation.

Requirements of the National Board of Fire Underwriters include, in Regulations for the Installation of Air Conditioning and Ventilating Systems in Other Than Residences, the following: "In systems utilizing re-circulation serving more than one story of a building or more than one fire section of a single story, fans shall be arranged to shut down automatically when the temperature of the air in the system becomes excessive as from a fire. For this purpose an approved manually reset thermostatic device, with a maximum setting of 125F shall be located in the system at a suitable point in the return air duct ahead of the fresh air intake. In the sections of the country with moderate summer temperatures it will be desirable and practical to moderately reduce the above temperature setting."

In addition to this fire preventive measure, it should be noted that where all vertical ducts pass though each floor there should be installed a suitable form of fire stop. This can be made either of masonry or in the form of a metal flashing in the open space around the insulation of the duct.

Another very important design factor is to keep any inflammable material at a distance of not less than 2 in. from all insulation and not less than 12 in. from any bare heat ducts or 30 in. from any smoke pipe. As the intensity of the radiant energy falling on a given area varies inversely as the square of the distance from the source of the heat it can be readily seen that it is necessary to take such precautions.

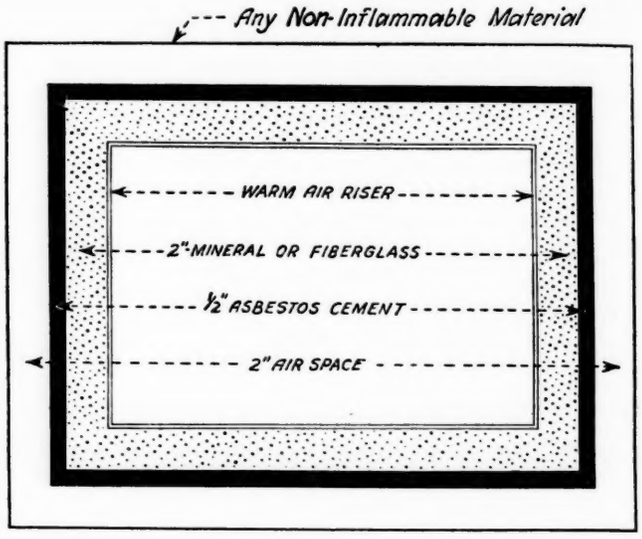


Fig. 5. Detail of supply risers showing insulation.

The practice of nailing metal or non-metallic ducts, insulated or uninsulated, to any wooden building member should not be permitted in any installation.

Insulation

It has been found from actual experience that insulation of a proper kind on any forced warm air heating system pays dividends many times over. On installations of this sort the writer uses a 2 in. blanket of mineral wool or fiberglas, with an expanded metal backing over the entire furnace and the warm air ducts throughout basement and furnace room. Over this there is placed a ½ in. thickness of asbestos cement applied in thin layers, the last layer mixed with one-third portland cement and troweled to a smooth, hard finish.

Return ducts in the furnace room need not be insulated, but those in the basement proper, where no heat is provided, should be covered with at least a 2 in. blanket of mineral wool or fiberglas, with wire mesh reinforcements, having all joints butt tight and laced with wire.

Where warm air and return ducts and branches are located in cold attic spaces, they should be insulated with a 2 in. blanket. Where the inside design is 80F to 90F, these ducts should have a double thickness of 2 in. blanket.

Registers play another very important part in the function of any system delivering air to a series of rooms. In this installation the writer provided warm air registers of the wall type, directional flow, with shutters and register boxes and designed for an outlet velocity of 600 to 700 feet per minute, located 8 to 10 ft above the floor, depending upon the ceiling height. For ceiling outlets a register similar to the Anemostat type B, with an outlet velocity of 1000 to 1200 feet per minute is used. Any ceiling register having a velocity of less than 1000 feet per minute will cause the air to impinge against the ceiling, travel along the ceiling to the walls, then down the wall to the return registers without giving up any of its heat where it is needed.

Beware of Elbows

JOHN J. WOOLFENDEN

Engineering Staff, Smith, Hinchman & Grylls, Inc., Detroit, Mich.

IN the design of any duct system for the distribution of air, the safe rule to follow is "keep control of the air flow." Avoid all unnecessary changes in the duct sizes and hence in air velocities. Make no changes at all in air velocities, unless for a definite logical reason and then make them in such a way that you are sure of the result.

For example, in checking fan performance in connection with a toilet exhaust system, it was found that the only portion of the trunk duct accessible was an elbow, on the discharge side of the fan.

Without expectation of a strictly accurate total capacity reading, the duct was explored with a pitot tube. Results showed that the greater portion of the air was flowing toward the outside (long radius sweep) of the elbow, but more interesting still, about 90% of the air was flowing in an area representing about 25% of the cross sectional area of the duct. In other words, the average air velocity in this crowded area, based upon a straight duct velocity of 750 fpm, was approximately

$$750 \times 4 \times .90 = 2700 \text{ fpm.}$$

The resulting friction on the adjacent surfaces might then be about $\left(\frac{2700}{750}\right)^2$, or about 12 times what it would be were the air flow uniform. Note that these quantities are averages and that the extremes would vary from them considerably. An analysis of the situation is interesting.

Offhand, it is often assumed that centrifugal force is the principal offender. It has some effect, it is true, but there is another angle to this situation that is often overlooked. In turning through the elbow, the air at various distances from the sweep sheet does not take the same time to pass through the elbow, even if the entire air stream follows the elbow curvature, since the paths of the various elements would be concentric circular arcs.

To take a concrete example, assume an elbow of 12 in. inside and 24 in. outside radius. A particle of air at the mid point, or at 18 in. radius, if it followed the curve of the elbow, would take only three-fourths as long to traverse the elbow as a particle at the 24 in. distance. Further, a particle on the inside, if it followed the curve, would require only half the time taken by a particle on the outside.

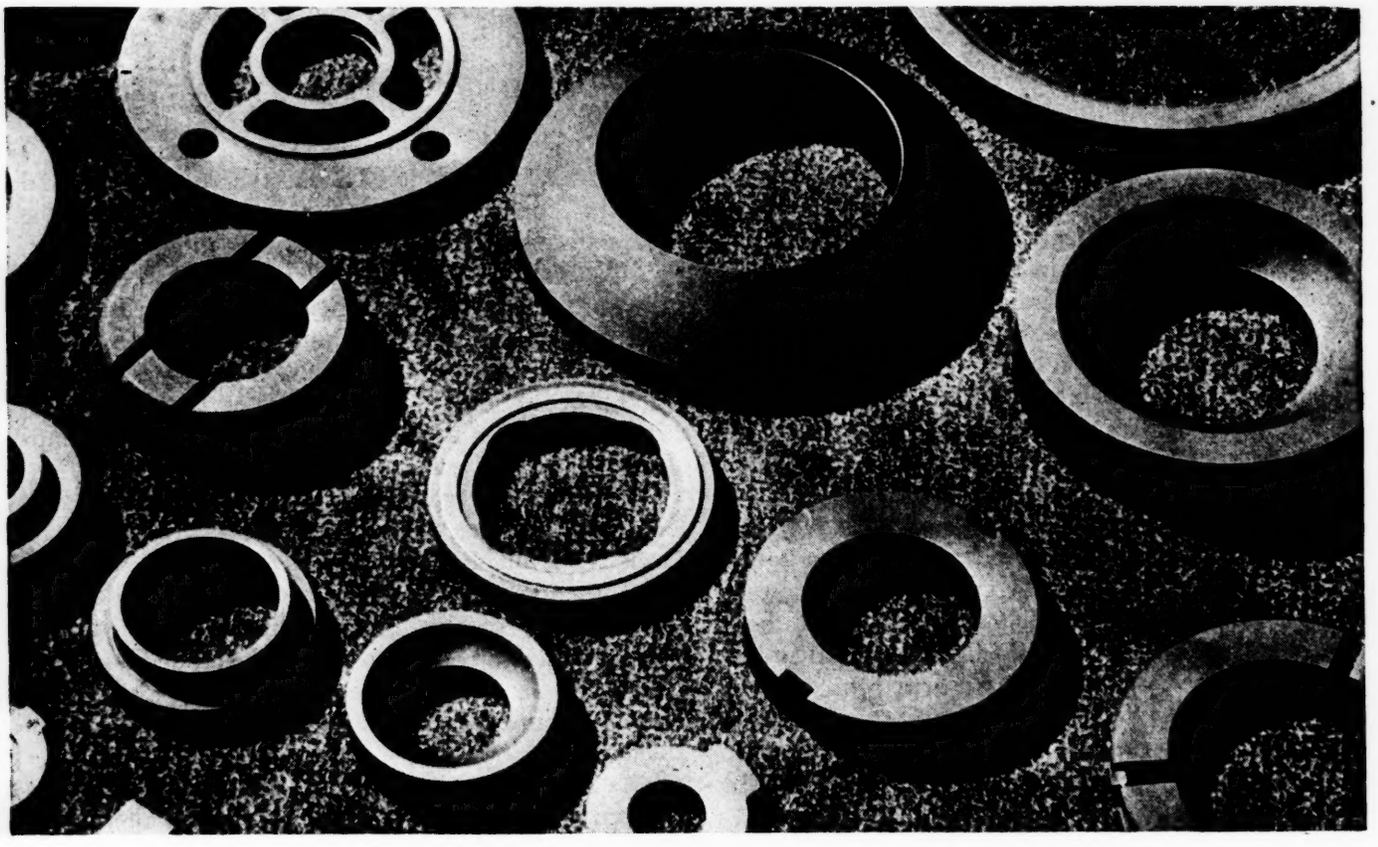
But the only curved surface capable of enforcing conformation to its shape is the outside surface; particles in contact with it follow the curve; particles farther in obey Newton's first law of motion and move in a straight line until they cushion on other particles (whose motion is affected by the sweep sheet) and tend to force them over to the side and also to "pile up ahead" of those which entered at the same time but were forced to follow the sweep sheet.

Therefore we have, in the curved elbow, excessive friction, non-uniform velocity, non-uniform direction and non-uniform air distribution; all plus secondary results such as impact, eddies, vibration of the air, and probably many other correlaries, the whole tending to produce a decided and very undesirable damping, or choking, effect.

From the foregoing, it appears that guide vanes in an elbow are a necessity, especially if the air velocity is high. Furthermore, the published results of authentic tests and experiments seem to be strongly in favor of the "square elbow" provided with guide vanes so constructed that their thickness compensates for the increased diagonal, or "corner to corner," dimension of the ell, and maintains uniform velocity.

As another example of the effects of changes in direction, in one of the larger buildings there was, until a few years ago, a 120-in., top horizontal discharge, steel plate fan. This fan discharged into the base of a steel stack, over 175 ft high, running through the roof. The suction inlet of the fan was connected to a duct from the kitchen of a restaurant. This duct ran (from the fan) about 40 ft south and 60 ft east before reaching the kitchen. In the machinery room it was straight, except for the one 90° elbow. In the kitchen, however, there were several turns. On attempting to check the fan capacity by pitot tube readings of the air in the duct, it was found that the air was vibrating so greatly that, throughout the whole duct, it formed a series of nodes and internodes and no satisfactory readings were obtainable. It was found necessary to take the readings above the roof, as that was the only other location where the duct work was accessible.

The damping effect of bends or offsets in ducts was nicely demonstrated by a vertical, up discharge, multiblade fan from which the discharge duct was started off with an offset to one side, of which the top side extended almost across the discharge opening. Just above this, another offset, of approximately the same extent, was made at right angles to the first one. Both offsets were at angle of about 45° to the vertical. As a result of this masterpiece of duct construction, the fan was found capable of handling about one-third the desired quantity of air, and it was necessary to straighten out this duct before satisfactory operation was obtained. In order to do this, owing to the arrangement of the structural features of the building, the fan had to be relocated. The major change could have been avoided in the first place.



A wide variety of products is made from this material. A few are illustrated.

Graphite Bearings and Seals

CARBON-GRAPHITE, which has self-lubricating properties and a low coefficient of friction, is manufactured as Graphitar in various shapes and sizes to serve as air compressor and steam engine piston rings, cylinder liners, grease seals, turbo blower seals, chemical bearings, water turbine seals, water pump blades, end plates, wear plates and other items.

Graphitar products resist chemical action, are mechanically strong and yet approach magnesium in weight. Its Scleroscope hardness number is from 30 to 100 and compares with other engineering materials hardness numbers as follows:

Brass	25
Cast iron	30
Fibre	35
Hard rubber	85
Hardened tool steel	90
Glass	100

Its tensile strength ranges from 750 to 2,500 lb per sq in; compressive strength is from 1,850 to 37,000 lb per sq in, and it should be used under compression rather than when in tension. Its breaking strength is from 3,750 to 13,000 lb per sq in. Some of the grades are resilient, and a ball made from one grade, when dropped on a smooth concrete floor, will rebound to 70% of the height from which it was dropped.

The range of weight per unit volume of three grades in pounds per cubic foot is 102.8 to 116; 0.0595 to 0.0672; and 0.952 to 1.074 ounces per cubic inch.

Some grades of Graphitar will not asbsorb any fluid and other grades will absorb as much as 20% by volume.

The coefficient of friction for the various grades ranges from 0.04 to 0.25. This is reduced considerably when a fluid is added. The material will not melt or fuse at any temperature; volatilization occurs at 6332F.

In general, it can be said that the thermal conductivity of Graphitar is less than that of copper but somewhat higher than that of cast iron. Because of its black body, it has a high radiating capacity. These two factors make a useful combination for dissipating heat.

While not affected by heat under neutral or reducing conditions, it will oxidize slowly and lose weight at approximately 700F, if heated in air or an oxidizing atmosphere. It is an electrical conductor and is non-magnetic.

Data and illustration for article supplied by The United States Graphite Co., Saginaw, Mich.

Heat Losses Through Floors of Basementless Buildings

THERE has long been some question regarding the accuracy of estimates of heat loss through the floors of basementless buildings. Heat loss coefficients in standard tables are for air-to-air; in the case of floors laid on the ground the air-to-air coefficient is probably in error. In addition, the temperature of the ground below the floor is exceedingly difficult to estimate.

Nevertheless, the estimating problem exists, especially in the field of low cost housing, and has recently received attention by the National Bureau of Standards, whose findings have been reported in one of the Department of Commerce Building Materials and Structures booklets.* The study was of concrete floors and wood floors laid over crawl spaces as well as on the ground.

The results showed that the heat loss of the floors laid on the ground was decreased by insulating the edges; that the heat loss through the center of such floors is relatively small when the enclosing structure is continuously heated; that the edge loss for a wood floor laid over a crawl space is small; and that the edge loss for an insulated concrete floor laid over a crawl space was considerable. The floors tested are illustrated in types 1 to 8 in the accompanying drawings.

For determining the heat loss through these floors, the general plan adopted was to provide a heavily insulated structure above a specimen of each kind of floor and to observe the amount of heat, supplied in the form of electric energy, necessary to maintain a temperature of 70F within the structure during cold weather. Although the walls and ceiling of the structure were heavily insulated, some heat loss through them was inevitable. To correct the data for this condition, tests were made during which the floors themselves were so insulated that the heat loss through the structure could be measured.

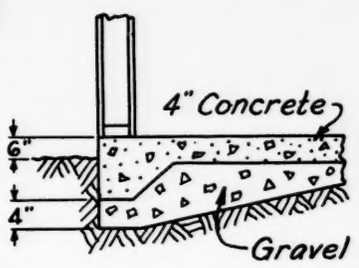
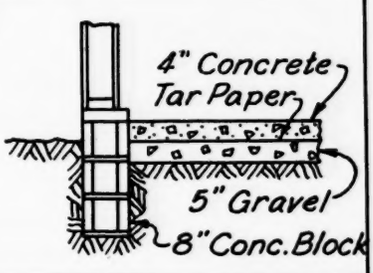
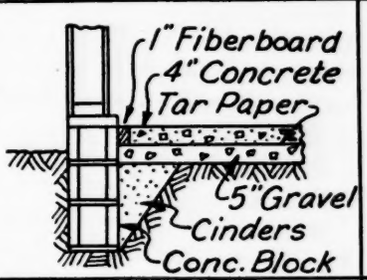
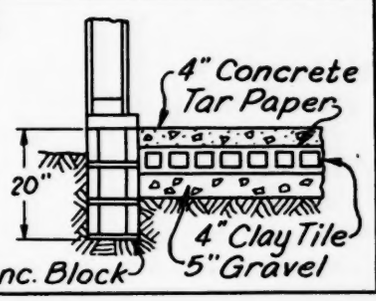
Floors on Ground

The investigators concluded that the heat loss of a floor laid on the ground is not proportional to the temperature difference between the air inside and the air outside of the house at any given instant. The floor heat loss appears to be dependent upon the temperature of the ground at some region beneath the surface, and this, in turn, depends upon the average temperature of the air above the ground and the amount of heat received by the ground from the sun and the amount of heat loss from it by radiation or otherwise during some period prior to the observation.

For each of the floors, 1, 2, 3, and 4, the observed heat loss was divided by the length of the exposed edge, as defined above, and the result entered in the tables as "heat loss per foot of exposed edge." From this three factors were derived, one of which is particularly useful.

The heat loss in Btu per hour per linear foot of exposed edge was divided by the average temperature difference observed during each observation period between the air inside the structure and the air outside, to yield a factor "F" which takes into account the exposed edge.

For estimating design heat losses from slab floors on the ground, the investigators propose three for-

TYPE OF FLOOR	VALUE OF "F" (in Btu per hr per foot of edge per F)
1 	0.81
2 	0.69
3 	0.55
4 	0.75

Four types of floor laid on ground. Loss factor F takes into account the exposed edge.

*Report, BMS103, "Measurement of Heat Losses from Slab Floors," by Richard S. Dill, W. C. Robinson, and H. E. Robinson. Available from the Superintendent of Documents, 10 cents.

mulas, of which the following is suggested by them as probably being the most adaptable:

$$Q = LF\ (T_i - T_g)$$

where

Q = heat loss through floor, Btu per hour,

L = length of floor edge adjacent to exposed wall of building, feet,

F = heat loss factor, Btu per degree temperature difference,

T_i = inside design temperature, F,

T_g = average outside temperature for week preceding instant for which estimate is to be made, F.

The last term (T_g) is the only one for which data are not readily available. The report did not include a table of this factor for various localities and, unfortunately, as defined the data could be confusing. To simplify the matter and to be on the safe side, it seems that T_g could be defined as

T_g = average outside temperature for the week preceding the coldest temperature of record, F.

Such data are simple to compile and have been obtained by questionnaire; they are presented in Table 1.

The following example will indicate the application of the equation:

Example. A 30 x 28 ft residence near New York City is built on a slab of 4 inches of concrete laid on 5 inches of gravel. What will be the floor heat loss?

Solution. The slab is similar to floor type 2, for which $F = 0.69$. The exposed edge L will add up to $(30 + 30 + 28 + 28) = 116$ ft. Presumably the inside temperature would be 70F, and from the table, T_g for New York = 14F, so that

$$Q = 116 \times 0.69\ (70 - 14) = 4480 \text{ Btu per hour.}$$

The data are probably sufficiently accurate basis for most estimating purposes because the floor heat loss is likely to be small compared to other losses. However, the data are incomplete in that they do not cover the cases of frozen ground and of snow-blanketed ground. To supply data, it would be necessary to repeat the tests in a colder climate.

No reason is apparent why the data are not applicable for regions where the average outdoor temperature does not remain continuously below freezing for more than a day or so, except that snow, which is an insulator, may decrease the floor heat loss.

The data indicate that insulating the floor at the edge is beneficial both in saving heat and in reducing lateral temperature gradients across the floor.

Floors Over Crawl Space

Floors tested by the Bureau over crawl spaces are illustrated in types 5 to 8, inclusive. This type of floor has a conventional heat loss coefficient (air-to-air). The authors' results checked computed values of U as follows:

Floor Type	U Value	
	Observed	Computed
5	0.24	0.27
6	0.46	0.50
7	0.34	0.38
8	0.30	0.17

TYPE OF FLOOR	VALUE OF "U" (in Btu per hr. per foot of edge per F)
5 Double Wood Flooring — Joist	0.24
6 4" Concrete — 1" Nailing Strips	0.46
7 Carpet — 4" Concrete — 1" Nailing Strips	0.34
8 4" Concrete — 1" Fiberboard	0.30
9 Single Y.P. Flooring — Joist	0.45
10 Single Floor — ½" Rigid Insulation	0.27
11 H.W. Flooring — Subfloor	0.34
12 Battleship Linoleum — Y. P. Floor	0.34

Floors over crawl spaces. Conventional loss coefficient U is used.

TABLE 1.—VALUES OF T_g FOR 51 CITIES FOR ESTIMATING HEAT LOSSES THROUGH FLOORS OF BASEMENTLESS BUILDINGS

Albany, N. Y.	5	Houston, Tex.	43	Portland, Me.	12
Atlanta, Ga.	20	Indianapolis, Ind.	16	Portland, Ore.	20
Baltimore, Md.	21	Kansas City, Mo.	—2	Rochester, N. Y.	6
Birmingham, Ala.	19	Lincoln, Neb.	0	St. Louis, Mo.	15
Boston, Mass.	8	Little Rock, Ark.	13	Salt Lake City, Utah	9
Buffalo, N. Y.	6	Los Angeles, Calif.	51	San Diego, Calif.	49
Chicago, Ill.	5	Louisville, Ky.	25	San Francisco, Calif.	45
Cincinnati, Ohio	17	Memphis, Tenn.	12	Savannah, Ga.	38
Cleveland, Ohio	16	Milwaukee, Wisc.	1	Scranton, Pa.	8
Dallas, Tex.	26	Minneapolis, Minn.	—4	Seattle, Wash.	29
Denver, Colo.	8	Nashville, Tenn.	14	Spokane, Wash.	—1
Detroit, Mich.	14	New Haven, Conn.	9	Syracuse, N. Y.	9
Duluth, Minn.	5	New Orleans, La.	32	Topeka, Kansas	—2
Fort Wayne, Ind.	13	New York, N. Y.	14	Trenton, N. J.	12
Grand Rapids, Mich.	8	Oklahoma City, Okla.	9	Utica, N. Y.	4
Harrisburg, Pa.	9	Philadelphia, Pa.	18	Washington, D. C.	14
Hartford, Conn.	16	Pittsburgh, Pa.	12	Wichita, Kansas	0

Summing up, the tests on floors laid over crawl spaces indicated that the factors contained in handbooks are suitable for estimating heat losses through such floors, except in the case of a floor which is heavily insulated on the underside. In this case, the edge loss increases largely in comparison to the total loss through the floor, and this may result in an underestimate unless it is taken into consideration. The number of factors involved indicate that heat losses through floors laid over crawl spaces should be computed on the basis of an estimated crawl-space temperature. For a continuously ventilated crawl space, the temperature should be assumed to be the same as the outdoor temperature.

Since the usual U values were found to be reasonably accurate for floors over crawl spaces, the accompanying table gives U values for four other floors (9 to 12, inclusive) *not tested* by the Bureau. These values are from H & V's Reference Data 73-74, and are included for convenience.

EPD Submerged Pipe Line

A new method of laying submerged pipe line is being recommended to Engineer Petroleum Distribution Units all over the Pacific. The problem which one EPD Company faced was to bridge a mile-wide gap between an offshore tanker anchorage and empty gasoline storage tanks on shore.

The regular methods of building a timber pile-supported hose deck wouldn't work, as there was too much mud. Some other means had to be improvised to permit ocean-going tankers to discharge their cargoes of fuel directly to the shore storage and distributing pipe line system.

The ocean floor sloped gently from the sand beach almost to level mud bottom 30 to 35 feet below low tide level at a distance of 4,600 feet from the shore. The Engineers decided to construct a submerged pipe line of 8-inch welded steel line pipe.

The first obstacle was six hundred feet of wet swampy land between the beach and the nearest road. Using tractors and scrapers to haul beach sand, the EPD Company built a combined assembly and launching area 600 feet long by 40 feet wide. On this foundation, timber stringers were laid to support sections of pipe placed at 15-foot centers to serve as supports during assembly and as skids for launching of the welded pipe.

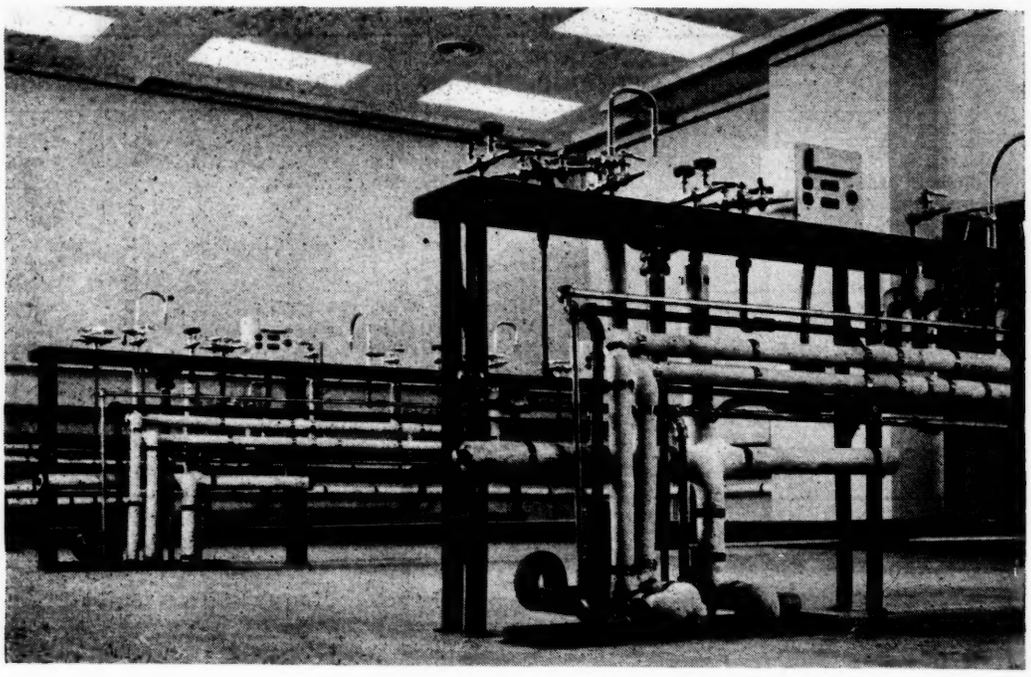
The pipe was assembled in sections on the ramp, and the sections joined by arc welding. When 4,800 feet of pipe had been welded into 600-foot sections a bridle of heavy chain was welded to the seaward end of the first section for towing and for attaching a marker buoy. A timber "sled" was framed around the seaward end of the pipe and the line was ready for launching.

The toughest problem of all was solved with the help of the Navy. A net tender with a winch provided motive power for the launching. Two 12-foot triangular range markers were erected on shore to guide the tender; in addition, blinker-light signal communication was maintained between ship and shore.

When all was ready, the ship was anchored on range. The winch line was run ashore and attached to the towing bridle. The first 600-foot section of pipe was winched out until its shore end came opposite the sea end of the second section. The two sections were aligned with the aid of a winch-equipped 2½-ton truck and joined by two welders working simultaneously to speed the operation.

This procedure was repeated until the required 4,600-feet of pipe was launched and floating just beneath the surface. During launching, marker buoys, improvised from large diameter pipe sections, were fixed to the line at 1,200-foot intervals to mark its course.

When the line was fully launched the "sled" at the seaward end was loaded with concrete blocks to sink and anchor it. While a tractor held a slight strain on the pipe to maintain alignment, water was pumped into the pipe to sink the line and the job was done. The total elapsed working time was 8 hours and 25 minutes.



Laboratory service piping. This will be concealed when the tables are completely installed

Services for a Research Laboratory

L. G. GRIEBLING

Engineering Department, The Firestone Tire & Rubber Co., Akron, Ohio

Firestone's new laboratory, besides being air conditioned, provides a number of unusual services at the laboratory work tables—high and low pressure steam, chilled water, distilled water, vacuum line, and direct and alternating electric current. Steam is supplied from a central power plant over a mile distant.

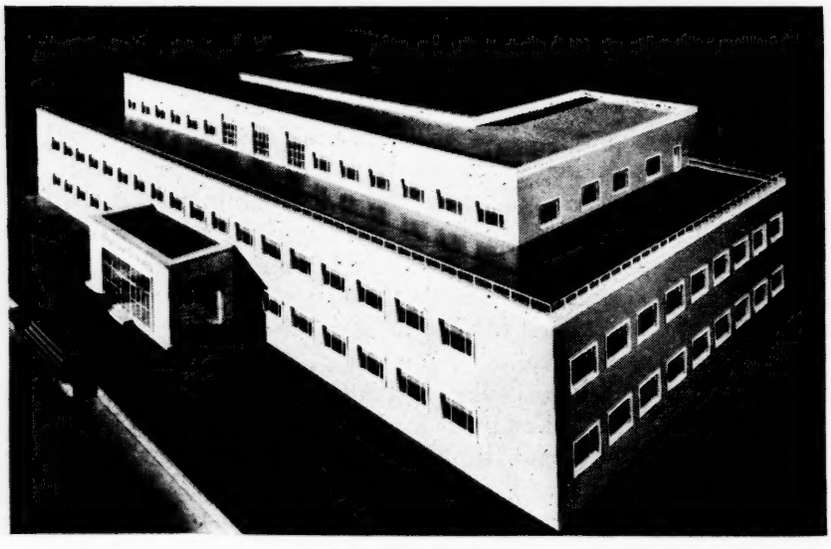
THE recently completed Firestone Research Laboratory, located on a hilltop in Akron, Ohio, overlooking the vast panorama of factory buildings, is about a quarter of a mile from the nearest factory building and over a mile from the power house. The building is 250 ft by 125 ft and consists of two stories and basement. This laboratory incorporates the very latest developments in building design and services.

The building was designed to provide the utmost in comfort and to supply those many services required in research work. The basic services supplied from outside sources are 180 lb per sq in steam, 2300 volt electric power, well water, city water, and natural gas.

A study was made to determine whether a boiler plant should be built at the site or whether the steam line should be extended from the nearest factory building 2,100 ft distant and thus obtain steam from the main power plant over a mile to the north.

In 1910 the original part of Plant I and the power house were built. It is doubtful if anyone at that time dreamed that manufacturing facilities would expand to their present extent. As new buildings were erected, expansion extended southward from the power house, and steam, water and electric lines were extended to serve the new buildings.

The original 8 in. steam line serving the Reclaim Plant and Plant II became too small in 1916. It was replaced with a 14 in. line to Plant II, and



Model of the Firestone Research Laboratory.

it was reduced to 12 in. from Plant II to Rim Plant.

This line was placed on rollers in a 4 ft square trench covered with concrete slabs. The line remained undisturbed until 1941 when a branch line was extended to the new Gun Carriage Building, and later a branch to the Aviation Products Building.

When the first Firestone operated synthetic rubber plant was erected in 1941, the question also came up as to whether a boiler plant was to be erected at the site. The established policy was not changed, so a 10 in. line about 3,700 ft long was run westward from the Rim Plant. Since then, a second synthetic rubber plant has been built and is served by this line.

Prefabricated insulated pipe conduit was used on this job with six expansion loops. The pipe is graded in the direction of flow and no separator is used in the entire 3,700 ft of line except where it enters the synthetic plants.

The 180 lb per sq in. steam furnished to this entire system is largely produced by evaporators in power house used in connection with the 1,400 lb per sq in., 300,000 lb per hr boiler installed in 1934. Steam is exhausted from the turbine at 235 lb per sq in. and condensed in evaporators in generating the 180 lb per sq in. process steam. Obviously steam can be produced at lower cost with this unit than in small isolated steam plants.

The precedent established was not changed for the Research Laboratory, so an 8 in. line, 2,100 ft long, was extended east from the Rim Plant. Here, too, prefabricated insulated pipe conduit was used.

Since the laboratory is located on a hill, it was not feasible to pitch the line in the direction of flow. A steam separator was installed where the line leaves the Rim Plant and another one where it enters the laboratory building. The line is large enough so that the steam velocity is low. The line has now been in service for several months and no trouble has been experienced with drainage of condensate. Prefabricated expansion loops were also used on this line.

The 2,300-volt electric service is obtained from the Plant II substation and the power is supplied from the 35,000 kw generating station at main power plant. This service and telephone lines are run underground in transite conduit encased in a concrete envelope.

An 8-inch cast iron well water line supplies water for the air conditioning system and is connected with the 24-inch main line from pumping station south of the factory buildings. After the water is discharged from condenser, it can be repumped as required for irrigating the extensive grounds about the building.

The building is completely air conditioned, and since the air could be contaminated by laboratory fumes none of the air is recirculated, which results in a high refrigeration load. Incoming outside air passes through a 30-cell electric precipitron filter and then through a bank of dry filters before entering the preheating coils. The air next passes through a conditioner equipped with water sprays for winter humidification and a double bank of cooling coils for dehumidification and cooling. The first bank of cooling coils is supplied with 400 gpm of 55F well water for precooling and the water is subsequently used on the refrigerator condenser. The second bank of coils is supplied with chilled water from refrigeration machine.

After the air is cooled and dehumidified for summer operation, it is reheated as conditions require to obtain proper humidity and temperature conditions in the laboratory.

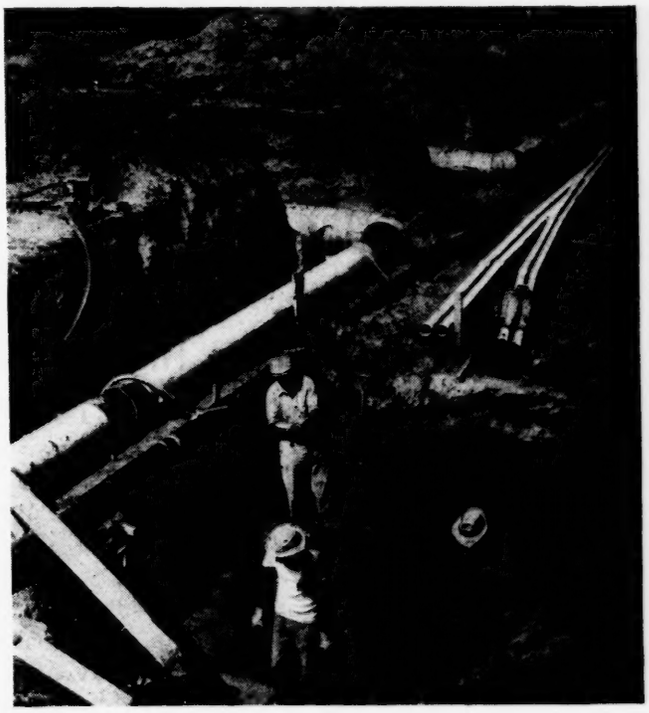
The refrigeration machine is of the centrifugal type, motor driven through gears, and has a nominal rating of 200 tons. Chilled water is circulated through evaporator at the rate of 600 gpm. A three-way by-pass valve is employed on cooling coil for regulating air temperature and the compressor is equipped with a suction damper to automatically control chilled water temperature.

The conditioning apparatus handles approximately 65,000 cfm and with few exceptions is discharged through flush mounted ceiling outlets. Several exhaust systems are used for removing air from building; those handling laboratory fumes are of special materials to resist corrosion.

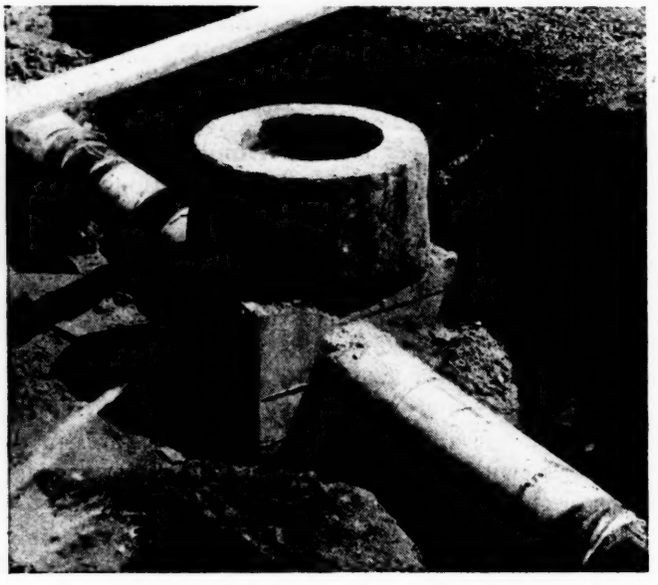
In addition to the general air conditioning system for comfort cooling, additional apparatus is provided to maintain special temperature and humidity conditions in some of the workrooms. These air conditioning units consist of direct expansion cooling coils, steam heating coils, steam jet humidification and silica-gel dehumidification.

Space has also been provided for a low temperature room 12 x 12 x 8 ft in which a minimum temperature of —80F can be obtained. This equipment will be installed when conditions permit.

The building is heated by forced circulation hot water divided into two zones. The 180 lb per sq in.



Photograph taken during the installation of the service lines, showing electrical and telephone conduit, cast iron water service line and prefabricated insulated steam conduit.



Prefabricated conduits extend into inside face of manhole with steam pipe riser provided for future service connection.

steam supplied to the building is reduced to 50 lb per sq in. which is used on preheater and reheater coils in air conditioning system, and heat exchangers used for heating water of the heating system.

All controls of both heating system and air conditioning unit are of the pneumatic type and function as follows:

During the summer season a dew-point thermostat controls the air temperature leaving the conditioner by operating a three-way valve in the chilled water line. An outside master thermostat controls a submaster thermostat located in an exhaust duct in the corridor which controls a steam valve of the reheater coil.

During the winter season all controls are switched and a second dew-point thermostat controls air temperature leaving the conditioner by controlling the steam to preheater coil. A thermostat in blower discharge controls steam to reheater coil. Manually operated pneumatic switches control the valves in the 28 booster coils so that occupants of the building can maintain temperature to suit their requirements.

Water temperature in the heating systems is controlled by an outdoor bulb thermostat.

A laboratory of this type requires a number of services at the work tables. Steam is supplied at 180 and 50 lb per sq in.

A single stage, 100 lb per sq in. air compressor delivering 105 cfm complete with after-cooler and receiver furnishes compressed air service to the building facilities.

A chilled water service is provided for laboratory use and drinking water. This consists of two 15-ton condensing units, water cooler and circulating pump which circulates 50 gpm. The unit is designed to cool water from 63 to 50F.

Distilled water is provided for laboratory use from a steam heated double still located in the penthouse. Each unit has a capacity of 5 gph. Two 50-gallon aluminum storage tanks are provided and water flows by gravity through aluminum piping and valves to laboratory tables.

A vacuum service is provided which consists of a dry vacuum pump having capacity to maintain 20 in. of vacuum when twelve ⅛ in. diameter inlets are open. A 36 in. x 72 in. vacuum tank is provided. All vacuum piping is copper tubing.

The hot water system for both laboratory and wash room use consists of a 500 gallon Everdure tank with a 1,500 gallon per hour steam heating coil with steam at 50 lb per sq in. Forced circulation is used and all lines are copper tubing.

Direct current is supplied through motor generator sets at 25, 125 and 250 volts. A-C service is supplied at 110 and 220 volts.

In addition to above services, city water and natural gas are piped to laboratory tables.

The services described above are distributed to the various laboratory work rooms through eight vertical pipe shafts.

Voorhees, Walker, Foley, and Smith of New York designed the building, working in conjunction with Firestone engineers.

Curtiss-Wright High-Speed, High-Altitude Wind Tunnel

Containing the most highly flexible range of testing conditions in the country and capable of testing airplanes in the "fast-as-sound range," a new $2,500,000 variable density wind tunnel at the Curtiss-Wright Corporation plant in Buffalo will soon go into operation.

Powered by a G.E. system, the tunnel will be capable of testing airplanes at pressure conditions comparable to those found at 35,000 feet. It contains an air volume of 210,000 cu ft.

The new tunnel will serve not only as a Curtiss "proving ground" but it will also be in a position to serve as a testing laboratory for other eastern airplane manufacturers.

The tunnel, with 378 ft of circuit length, has an 8½ × 12 foot test chamber which permits testing a model of 10-foot span. Over-all length of the tunnel is 178 feet. Its over-all width is 81 feet. The tunnel stands 36 feet from the ground at its maximum height.

Employing four compressors, air in the three-quarter inch steel shell may be pumped to 60 lb per square inch.

On the other end of the pressure range, the tunnel may be evacuated to a pressure of 4 lb per sq in, equivalent to the minimum pressure encountered in flight at 35,000 feet.

Flow of Steam Through Orifices

CHARLES A. POHLIG

THE formula below covering the flow of steam through orifices, takes into account either moisture or superheat content, both of which are of prime importance in actual practice.

The equation is:

$$W = \frac{1.555 \times A \sqrt{H_1 - H_2}}{V}$$

Where W = steam flow, lb per sec through a rounded orifice

A = orifice area, sq in.

H_1 = total heat of steam (above 32F) in initial state, Btu per lb

H_2 = total heat of steam (above 32F) in orifice, Btu per lb (same entropy as initial condition)

V = specific volume of steam in orifice, cu ft per lb, at same entropy as initial condition

1.555 = a constant

If the orifice instead of being rounded has a sharp approach or entrance, such as one produced by drilling a hole through a plug or plate, then W_1 should be multiplied by 0.86. Values of H_2 and V_2 correspond to a pressure determined as follows: When the final or back pressure is *over* 0.58 of the initial pressure, values of H_2 and V are those of the back pressure; when the back pressure is *less* than 0.58 of the initial pressure, values of H_2 and V are based on a steam pressure of 0.58 times the initial pressure.

Special mention will be made of these items as they appear in the problems shown below:

Problem: Determine the quantity of steam at 112 lb per sq in absolute and 94F superheat flowing into a 29-in. vacuum. The orifice is rounded and its diameter is 0.5625 (9/16) in.

Solution: Orifice area = $(0.5625)^2 \times 0.7854 =$ 0.24850 sq in. The final pressure, 29-in. vacuum, is less than 58% of the initial pressure, therefore, 112 lb $\times$ 0.58 = 65 lb absolute pressure is to be used.

From the Mollier diagram in the Keenan steam tables (1930 edition), H_1 is found by locating the intersection of the 112 lb line and the 94F superheat line. The total heat (enthalpy), or H_1, is 1241.0 Btu per lb, as indicated by the scale appearing on the left and right of the diagram margin. In addition, the entropy is observed (vertical lines on chart) in this case as 1.6552.

To determine the condition of steam in the orifice, follow the vertical (adiabatic or constant entropy 1.6552) line downward to a point where it and the 65 lb absolute pressure line intersect; it will be found that the steam is superheated 25F, and the total heat, or H_2, is 1192.6 Btu.

V, or the specific volume of steam in the orifice, is 6.922, as found in the steam tables corresponding to 65 lb absolute pressure and 25F superheat; the entropy is found to be 1.6552.

By substituting these figures in the equation, we have:

$$W = \frac{1.555 \times 0.24850 \sqrt{1241.0 - 1192.6}}{6.922} =$$

0.38837 lb per sec or $(0.38837 \times 3600) = 1398$ lb per hr.

The problem stated that this was a rounded orifice; however, had this been a sharp entrance orifice, the flow would be multiplied by 0.86.

If and when H_2 is found in the moisture or wet zone on the Mollier diagram, it is necessary to multiply V by the difference between the moisture content as found on the chart (expressed as per cent) and 1.00. For example, if 2% moisture is present, multiply saturated steam volume at the pressure corresponding to V, by 0.98 in this case. A problem will be solved to elaborate on this.

Problem: Determine the flow of dry saturated steam at 91 lb absolute pressure into a region of 60 lb pressure. The orifice is 0.0625 (1/16) in. in diameter with an area of 0.00307 sq in, and has a sharp entrance.

Solution: Find H_1 on the Mollier chart (as previously) to be 1184.8 Btu and the entropy 1.6099.

The 60 lb pressure remains unchanged in this case because it exceeds 58% of the initial pressure. Proceed downward on the vertical (adiabatic or constant entropy) line (namely 1.6099) to a point where it and the 60 lb absolute pressure line intersect, and read from the moisture curve, 2.7% moisture; also H_2 is found to be 1152 Btu per lb.

The value of V at 60 lb pressure is 7.172 according to steam tables. However, since the steam quality is less than 1.0, V becomes (1.00 — 0.027) = 0.973, and 0.973 $\times$ 7.172 = 6.978.

By substituting these values in the formula we have:

$$W = \frac{1.555 \times 0.00307 \sqrt{1184.8 - 1152.0}}{6.978} \times 3600 =$$

14.105 lb per hr for a rounded orifice. The problem states that this is a sharp edged orifice so that it is necessary to multiply the result by 0.86: 14.105 $\times$ 0.86 = 12.13 lb per hr through a sharp orifice.

The Solar House: A Full-Scale Experimental Study

F. W. HUTCHINSON

Professor of Mechanical Engineering, Purdue University, Lafayette, Indiana.

This article is prepared in cooperation with the Housing Research Division of the Purdue Research Foundation: G. Stanley Meikle, Research Director of the Foundation; Carl F. Boester, Housing Executive.

How much of the sun's heat can be captured and retained for delayed release as required? This and other questions about solar radiation may be answered for engineers and architects by the work at Purdue University's new solar house.

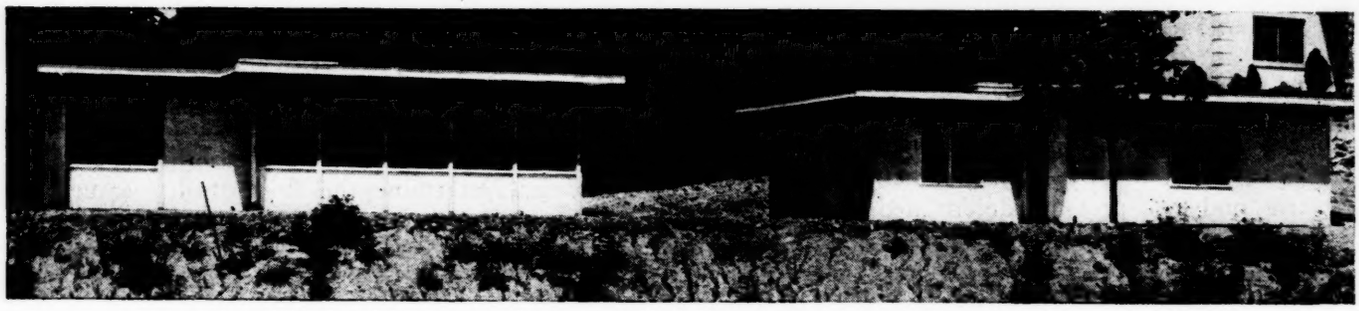
EXACTLY fifty years before the United States became a nation, Jonathan Swift sent Mr. Gulliver to the floating island of Laputa where he interviewed a scientist who "had been eight years upon a project for extracting sunbeams out of cucumbers, which were to be put into vials hermetically sealed, and let out to warm the air in raw inclement weather." In the two hundred odd intervening years since Gulliver set out on his travels Dean Swift's caustic observations have in some respects taken on the quality of prophecy rather than of satire. Today some of the qualities of solar energy are extracted from fresh vegetables "put into vials hermetically sealed" and dispensed as vitamins from the counter of the corner drug store. Further, houses are being planned and constructed which not only permit more effective utilization of solar energy, but actually accomplish the short-time storage of such energy for regenerative use during later hours when the sun has set. Such houses, designed both to capture a maximum quantity of solar irradiation and to utilize it—for heating purposes—at a controlled rate are commonly referred to as "solar" houses.

During the last ten years innumerable claims and counter-claims have been advanced concerning the solar house. It has been said that inside air temperatures of 85F and higher have been experienced in solar houses when the outside air temperature was below freezing and the heating system turned off; reading such claims some engineers have asked with pardonable sarcasm if it would then be necessary to provide refrigeration, as a prerequisite to comfort, even during the winter months. Substantial reductions in seasonal heating costs are said to have been found from some installations while results of an opposite order are attributed to other installations. Where, in this confusion of claim, opinion, and estimate, does the truth lie?

The Project

In an attempt to find an authoritative answer to the above question the Purdue Research Foundation, working in conjunction with staff members of the Purdue School of Mechanical Engineering and co-operatively supported by a grant from the Libby-Owens-Ford Glass Company, is undertaking an extensive theoretical and experimental study of solar housing. The intent of the project is to establish, by means of an analytical heat balance procedure, a rational theory applicable to the thermal problem of solar construction; one from which the engineer can deduce with adequate accuracy the advantage or disadvantage (from the standpoint of heating costs) of using large glass areas in typical solar construction.

The problem is, obviously, a complex one. Energy gain depends upon the transmissivity of the glass, but is also influenced by the ratio of absorbtivity to reflectivity. Likewise, it is a function of geographical location and of climate. The outside air temperature during the winter months, the amount of sunshine and the time of day—for a given locality



The solar house, left, has a floor plan and general structure identical to the orthodox house, right, except for 2/3 glass area on southern exposure.

—during which the sun most frequently is obscured: these and many other factors (as wind velocity, type of glass, thermal conductance of the exterior walls of the structure, etc.) must be considered in setting up a general procedure for evaluating the advantage or disadvantage of using the solar principle for a particular house in a particular locality. When the study has been completed it is hoped that the engineer will be in a better position to determine factually whether a gain or a loss will accrue from use of the solar idea in a given structure.

Concurrent with the theoretical investigation, a "laboratory" study based on two full-scale test houses is in progress. The two houses, constructed particularly for this project, are of identical floor plan and of similar construction. To assure essentially the same conditions of exposure to wind, air, and sunshine they have been erected side by side on a constructed knoll located on the Purdue Housing Campus. The only essential difference between the two houses is that one has the customary ratio of glass to wall area while the other, the solar house, has glass across the entire upper two-thirds of the south wall. The photograph shows the houses as they appeared in early August, 1945. The picture was taken at two p.m. on a sunny afternoon and it will be observed that the roof structure protrudes sufficiently to shade the windows from the sun; the line of shadow is clearly evident just below the base of the windows. In winter, when the path of the sun is closer to the horizon, the windows will, of course, be directly irradiated.

During the coming winter the two houses are to be electrically heated and the costs compared for maintaining conditions of equivalent comfort in both structures. Such a comparison will, of course, take account of the difference in mean radiant temperature needed due to the difference in average inside surface temperatures. Both houses are being elaborately equipped with instruments including a series of thermocouples with electronic 24-hour recorder, radiometers and heat meters for determining the transfer rates of solar energy through the windows and the rate of energy dissipation by convection and radiation from the floor slab to the room air.

The keystone of the solar project is the theoretical study. A rational heat balance procedure is being developed, and parallel with the rational treatment, experimental work is being conducted in the full-scale houses. Basically the program calls for development on paper of an hypothesis for solar analysis with subsequent test in practice to substantiate, develop and possibly simplify the theoretical design procedure and the performance analysis.

Further, the test houses provide excellent laboratories for studying the regenerative effect of floor slabs and the control problems associated with periodic energy sources.

Aside from their use in the study of solar houses, the two test structures afford an excellent opportunity for investigating under actual operating conditions the influence of "radiant drafts" due to the presence of relatively large low-temperature inside surfaces. When the primary solar studies have been completed it is now planned to use the houses in an experimental investigation of non-uniform irradiation effects and their influence on the comfort of the occupant. Such a study would be of interest not merely to the designer who proposes the use of large glass areas, but also to the engineer or architect who contemplates the installation of a small-area high-temperature heating panel.

Conclusion

The solar house is said to possess thermal, aesthetic and other advantages over houses of conventional construction. Emphasis should be placed on the fact that the present program is designed to study only the *thermal* performance of such a house. All other factors are outside the scope of the program which has been discussed here. This program has as its sole objective the determination of sound, accurate engineering data from which can be established an adequate design procedure and a simple method by means of which the engineer and architect can evaluate the thermal dividend or the thermal penalty which, in a given locality and for a given type of structure, will be associated with solar design.

Caves Used for Cold Storage Plant

The 4163rd Quartermaster Refrigeration Company believes it operates the Army's most unusual cold storage plant. It uses three vast tunnels, 50 feet underground and opening on the face of a Normandy coastal cliff, for storing as much as 3,000 tons of fresh meat at a time.

The caves were excavated by the French about 1928 for use as ammunition dumps. Following the Normandy landing, Engineers installed a system of overhead ammonia pipes and a freon cold-blowing apparatus which maintains a constant temperature of about 14F.

Each tunnel is about 250 feet long and 30 feet high with four sizeable lateral bays leading off on either side of each passage. Operating on a round-the-clock schedule, the Quartermasters receive the meat by truck directly from refrigerated vessels, stack it in the bays, and re-issue it to the big refrigerated vans for the journey to the front.

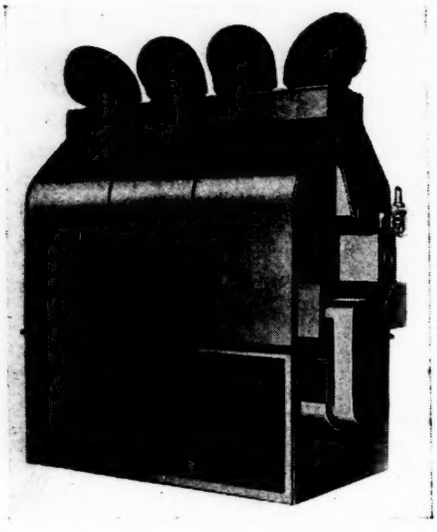
EMPLOYMENT SERVICE FOR VETERANS

Position-wanted advertisements in HEATING AND VENTILATING are available without charge to returning veterans seeking positions in engineering capacities in heating, air conditioning, ventilation, piping and refrigeration. The advertisement should not exceed 25 words; identities will not be revealed. Address the Editor.

NEWS OF EQUIPMENT AND MATERIALS

Direct-Fired Heaters

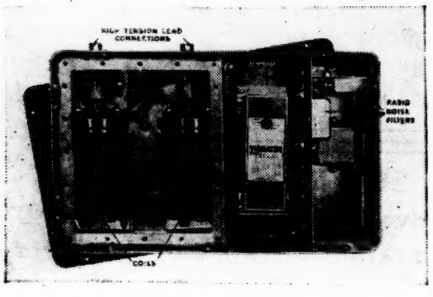
NAME—Davis direct fired heaters.
PURPOSE—For commercial and industrial applications.
FEATURES—Heaters, available for all types of fuel, are made entirely of steel, are completely self-contained and are equipped with fully automatic control systems. Filters may be applied without special transformations requiring additional floor space. Tubes may be cleaned while standing on floor. Heater has independent V-belt driven induced draft fan. Unit is shipped in two sections



so that it can be handled without heavy crane facilities.
SIZES AND CAPACITIES—Outputs of 75,000 to 2,000,000 Btu per hr.
MADE BY—*Herbert H. Davis Co., Cicero, Ill.*

High Altitude Ignition

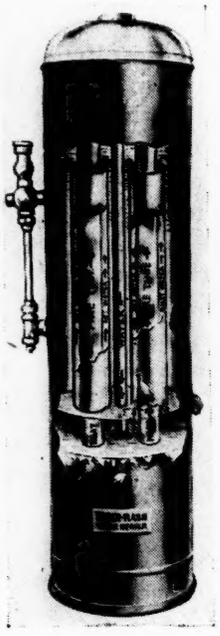
NAME—Aircraft heater spark ignition.
PURPOSE—For positive ignition of aircraft combustion heaters at all altitudes.
FEATURES—Aircraft heaters equipped with the new ignition coil box assem-



bly can be ignited without preheating of fuel at altitudes from sea level to 63,500 ft at —67F.
MADE BY—*Surface Combustion Corp., Toledo 1, Ohio.*

Water Heater

NAME—Perco-Flash water heater.
PURPOSE—To provide a dependable supply of hot water.
FEATURES—Hot gases from the burner combustion chamber pass through vertical fire tubes. The fire tubes are surrounded by outside tubes through which water flows. As the water hits the fire plate, it splashes, partially vaporizes and instantly rises in the space between the two tubes. Only a small amount of water can percolate up this narrow space and heat is quickly absorbed from the fire tubes. A portion of the hot water is recirculated through the equalizing tube rising into the cold water supply chamber above to mix with the cold water coming from the supply line.



Claim is made that the high speed circulation of hot water minimizes the tendency for mineral salts to deposit on the tubes or cause corrosion.

Heater is provided with a vaporizing type mechanical draft ball flame oil burner.
SIZES—Comes in models of 6, 25, and 35 gallons storage capacity.
MADE BY—*Kresno-Stamm Manufacturing Co., 730 6th Ave., New York 10, N. Y.*

Smoke Detector

NAME—Control type A26X and light source type L11RX.
PURPOSE—For the detection of smoke in air conditioning ducts.
FEATURES—When smoke of a predetermined density cuts down the intensity of the light that strikes the control, the system may sound an alarm, turn off blowers, operate automatic dampers, or provide other types of control. Type A26X is so designed that either current or tube failure will cause the control to operate as though the light beam were interrupted. Units are available in Underwriter approved explosion proof housings or in weatherproof pressed steel housings.
MADE BY — *Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass.*

Temperature Control

NAME—Vari-Temp cold cabinet.
PURPOSE—Temperature controlled test chamber within range of —90F to 220F
FEATURES—Cabinet is cooled by dry ice. Apparatus and specimens under test are readily visible at all times through a seven-pane sealed window. Illumination is by a fluorescent light shielded to prevent direct and indirect glare. Thermometers and instruments in any part of the chamber can be read easily from the outside. Constant temperature is in-

sured by an air stirrer which holds the temperature constant to ± 1F. This fan is automatically turned off when the door is opened to prevent a rapid temperature change. A blower circulates the air to and from the chamber. Unit also has a heater.

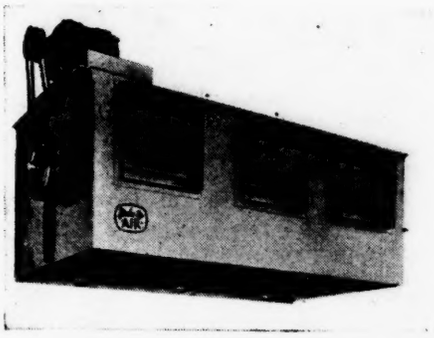
Starting at ambient temperatures of 75F, it will require one hour to get the cabinet temperature down to —25F; 2½ hours to —50F and 4½ hours to —75F.
SIZES AND CAPACITIES—1 cu ft and 8 cu ft.
MADE BY—*Precision Scientific Co., 1750 N. Springfield Ave., Chicago 47, Ill.*

Liquinoleum

NAME—Liquinoleum.
PURPOSE — A waterproof coating for roofs, walls, and other surfaces exposed to the elements.
FEATURES—Said to have about eight times the protective thickness of paint. It is resilient, highly resistant to extremes of temperature. Is unaffected by acid fumes or the effects of most chemicals. It does not crystallize on setting. Readily applied to any surface with brush or trowel.
MADE BY—*Continental Asbestos and Refining Corp., 1 Madison Ave., New York 10, N. Y.*

Make-Up Air

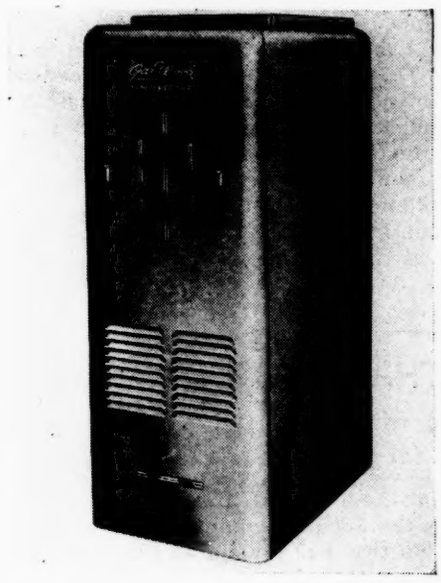
NAME—Make-Up Air.
PURPOSE—To replace exhaust air and balance minus pressures.
FEATURES—Delivers warmed, filtered outside air to industrial spaces to replace exhausted air and balance minus pressure. Is said to control drafty conditions and uncontrolled



infiltration. Made in four sizes from 5,000 cfm to 20,000 cfm. The basic unit consists of heating element, fan, motor with adjustable speed V-belt drive, and welded steel housing. Optional accessories may be added.
MADE BY—*The New York Blower Co., 32nd St. and Shields Ave., Chicago 16, Ill.*

Home Heater

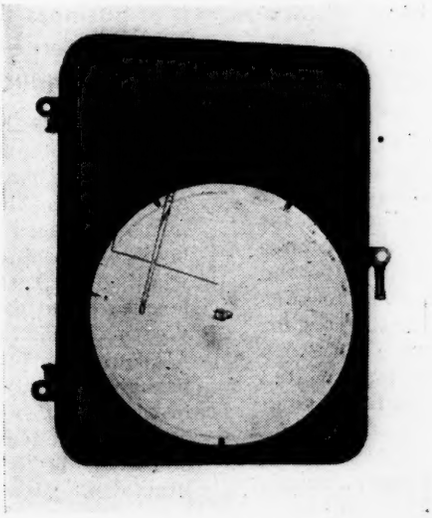
NAME—Gar-Wood Tempered-Aire.
PURPOSE—Automatic heating equipment for the home.
FEATURES—Changes have been made in the Tempered-Aire and boiler-burner units so that they are now more compact and will operate at



higher efficiencies than the prewar models. New models are to be built almost entirely for die formed parts which makes for easier assembly and improved appearance.
MADE BY—*Gar Wood Industries, Inc., Detroit, Mich.*

Running Time Recorder

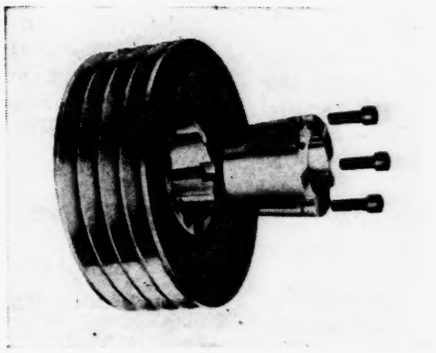
NAME—Bristol running time recorder.
PURPOSE—A device for checking machine performance.
FEATURES — Instrument records the



operating time of production machinery and other equipment. Chart shows the "on" period in hours, minutes and seconds. Chart also shows the "off" periods.
MADE BY — *The Bristol Co., Waterbury 91, Conn.*

V-Belt Sheave

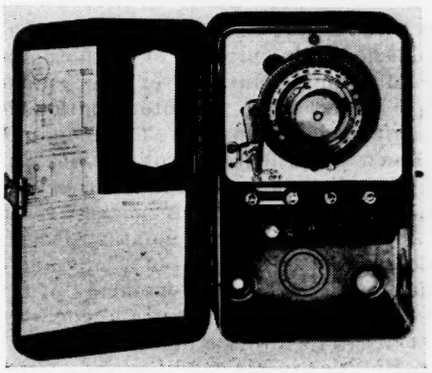
NAME—Taperlock.
PURPOSE—To quickly mount and demount V-belt sheaves.
FEATURES—To install the Taperlock sheave it is necessary only to slip the sheave and bushing assembly onto the shaft and tighten two or three locking screws. The screws are in threaded engagement with the sheave hub and free in the bushing groove. As the screws are tight-



ened, they push against the tapered bushing forcing it into the tapered bored hub. This causes the bushing to contract and wedge between the hub and shaft on which it is mounted. To remove the sheave from the shaft, the locking screws are removed and inserted in jack screw holes.
MADE BY—*Dodge Mfg. Corp., Mishawaka, Ind.*

Time Switches

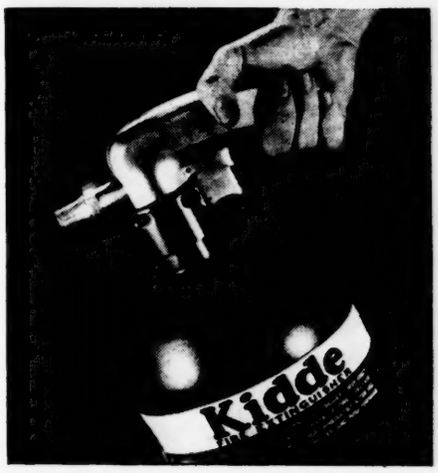
NAME—Paragon 300 Series.
PURPOSE—For controlling attic fans, stokers, oil burners, blowers, pumps, valves, motors, etc.
FEATURES—Latest improvement is use of a Telechron motor featuring



self oiling lubrication, practically instantaneous self-starting at full rated load, fully sealed gear reduction, low power consumption. Said to be light in weight, compact in design, 300 Series has switch capacity of 3000 watts per pole with skip-trip feature, and two bearing plate construction.
MADE BY—*Paragon Electric Co., 37 W. Van Buren St., Chicago 5, Ill.*

Trigger Control

NAME—Kidde carbon dioxide control.
PURPOSE — Simplified control of gas from larger models of portable fire extinguishers.
FEATURES—Valve has only one directional change in the valve passage,



thereby giving a full flow of liquid CO_2 directly to the nozzle. Streamlined one-piece handle closure protects the valve. Extinguisher is carried and operated with one hand, to provide an on and off control of CO_2 snow.
MADE BY—*Walter Kidde & Co., Inc., 140 Cedar St., New York 6, N. Y.*

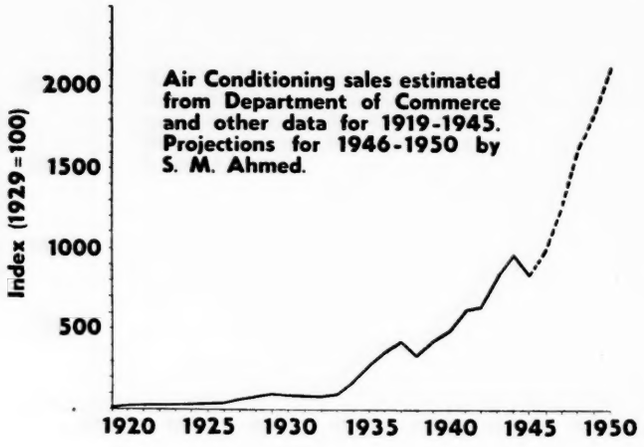
NEWS OF THE MONTH

AIR CONDITIONING – 1950

Study completed by Wall Street economist reveals optimistic future in new and replacement business.

• **PROJECT.**—Early last spring a Wall Street economist undertook the project of a thorough study of the air conditioning industry from the standpoint of its future and the effect of the future outlook on stocks of firms making such equipment. The economist, Shaikh Muzaffar Ahmed, with degrees from Bombay and Union Colleges in electrical engineering and from Northwestern in business administration, interviewed, researched, visited and computed for several months; late in August he completed his study, prepared a long and detailed report for his firm, Hirsch & Co., members of the New York Stock Exchange. This Hirsch & Co. condensed to four printed pages confined to the financial aspects of and investment possibilities in air conditioning.

Mr. Ahmed's final report was in two parts: The first is a comprehensive discussion of the history, scope, manufacturers, applications, present situation and future outlook for air conditioning. The second part is confined



to the financial, technical and business histories of Carrier Corporation and York Corporation, with estimates of the futures of both companies and their probable earnings for the next five years. Carrier and York were selected because both companies are primarily air conditioning and refrigeration equipment makers, and therefore almost exclusively dependent on these fields—unlike G.E., Westinghouse, and many others.

• **RESULT.**—Conclusions painstakingly reached were:

(1) "The greatest strides toward the solution of basic technical problems seem to have already been taken . . . . . "
(2) "The big problem . . . is to bring prices down . . ."
(3) "The saturation point [in residential, commercial and industrial buildings] is still in the distant future."
(4) "The replacement market is looming as a large factor."
(5) "The near-future progress of residential air conditioning will be slow but . . . . . [with] imposing potentialities."

and, in regard to Carrier and York,

(6) "... they have better than average prospects."
(7) "... [their] common stocks are considered attractive at present levels . . . "

STURTEVANT SOLD

Westinghouse Electric acquires fan and blower business founded before Civil War; purchaser to merge activities with its air conditioning and industrial refrigeration division.

• **COMPREHENSIVE.** — The 85-year-old business founded by Benjamin Franklin Sturtevant for manufacturing an exhaust fan for New England shoe factories, and which, as the B. F. Sturtevant Co., has made history in many phases of air handling and air conditioning, has been acquired by Westinghouse Electric Corp., as a wholly-owned subsidiary. This pioneer fan company began operating as the B. F. Sturtevant Division of Westinghouse Electric, on Sept. 1.

Acquisition of Sturtevant gives Westinghouse a comprehensive and in some directions an unusual position in air conditioning and ventilation work. Headquarters of the expanded air conditioning activities of Westinghouse will be located in Boston, presumably at the main Sturtevant plant in Hyde Park. However, heavy-duty and industrial refrigeration manufacture will continue at Jersey City, N. J., along with production of the Precipitron, the Westinghouse electronic air cleaner, according to Ellis L. Spray, vice-president in charge of the Air Conditioning and Elevator Divisions of Westinghouse.

Sturtevant's entry into the air handling business in 1860 was incidental. At that time shoe soles were attached to uppers by wooden pegs. Sturtevant saw that the method of fashioning the pegs was crude and costly. He invented a wood veneer lathe to cut a continuous spiral ribbon of wood from logs to provide an ideal material from which the shoe pegs could be split. But when he saw that the wood shavings spurting from the machine hindered the workmen, he invented an exhaust fan to collect and remove the shavings.

• **PIONEER.**—Sturtevant lays claim to many "firsts": introduction of forced draft on the U. S. S. *Alliance*—first warship so equipped—in 1886; mechanical ventilation for the U. S. S. *Richmond* in 1879, blast heating and ventilating for the U. S. Capitol in the nineteenth century; comfort air conditioning for the Pompeian room of Chicago's Congress Hotel about 1911; industrial process air conditioning in a Boston chocolate plant in 1906; a railway car conditioning system in 1910, and ventilation of the Holland Tunnel in New York.

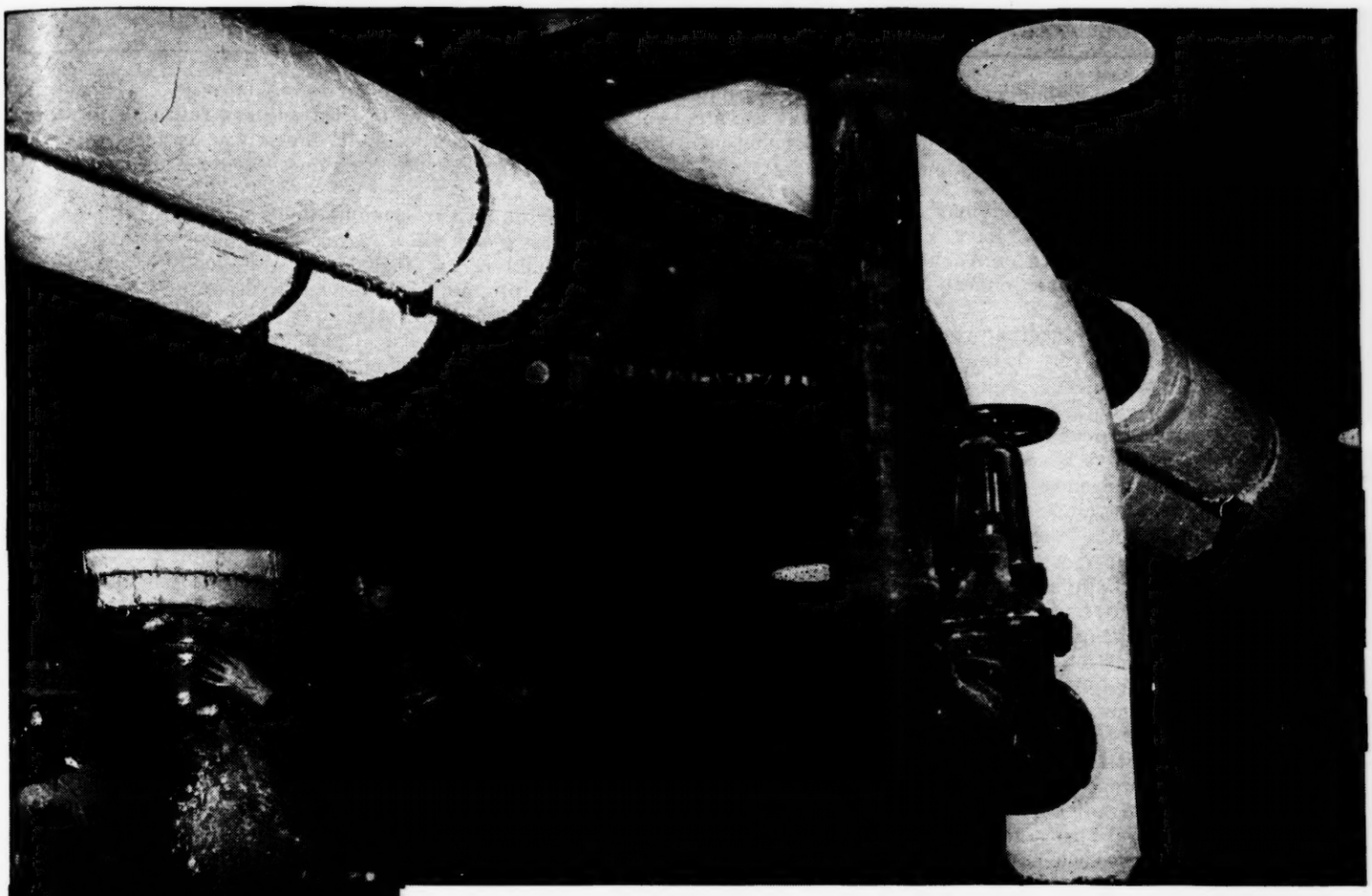
Sturtevant products include air conditioning units, air washers, numerous types of blowers and fans, heating and cooling coils, dust collectors, and unit heaters.

THE ATOM—THREAT OR PROMISE?

Will the next fifty years put a harness on atomic power for domestic use?

• **HIROSHIMA.**—That the blast at Hiroshima shook the world is evidenced by the flood of opinion, reaction, prediction, and speculation that has inundated the nation's press. Now that it has ebbed to a level within the bounds of sober thought, a few opinions pertinent to the field of HEATING AND VENTILATING are of interest.

• **BRANIN.**—Dr. M. D. Branin, technical consultant of the Bituminous Coal Institute, believes that eventual use of atomic energy for peacetime uses is likely but that it will be a long, long time before it can affect present power sources. Dr. Branin says that not only will it be



The larger the pipe, the greater the insulation saving contributed by streamlined Tube-Turn welding fittings.

Insulation fits smoothly because elbows and pipe form one continuous tube; no bolts to tighten, no gaskets to leak.

IT'S INSULATED FOR KEEPS!

In Cleveland's modern municipal power plant, the Tube-Turn welding fittings were as easily insulated as the pipe, because the welds form one continuous tube. There will be no future expense and trouble removing and replacing insulation every time bolts need drawing up or leaky gaskets need replacement. Once insulated, a system using Tube-Turn welding fittings is insulated for keeps!

Furthermore, welding the 10" and 6" steam lines shown here saved approximately 55% in joint costs over flange connections. Other benefits of Tube-Turn welding fittings include lighter weight, greater strength, and increased efficiency of flow. Because they require less space, they permit more flexibility of layout.

For complete information on the superiority of Tube Turns' exclusive manufacturing methods and data on successful installations in many industries, write for latest complete Catalog 111.

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generations before atomic energy will replace present power, but there is no present indication that atomic synthesis will ever substitute for the 200,000 commercial products that stem from bituminous coal.

• **KAEMPFFERT.** — Waldemar Kaempffert, science editor of *The New York Times*, gives evidence in his Sunday Magazine feature of August 19, that it will be fifty years before atomic energy will be put to work constructively for man.

The article points out that so far only a small fraction of a comparatively rare and costly element has yielded to the energy releasing bombardments of science. Furthermore, it is a far cry from a destructive bomb to a constructive engine the engineering principles of which have scarcely been dreamed of.

Assuming that atomic engineering will follow somewhat along the evolutionary lines laid down by the development of other energy sources, Mr. Kaempffert postulates that the most immediate possible use of the exploding uranium atom (perhaps in 25 years) will be as a source of heat. If this is so and science devises a means of substituting the heat of atomic explosions for the heat of combustion of today's fuels, the only noticeable change in the industrial scene will be in the fire box of boiler plants. Everything else will be much the same in principle until an atomic engine using controls as yet unheard of can be devised. And of course even this change presupposes that the cost per unit of atomic heat will be less than that of other fuels. Coal and oil companies are urged to take comfort in the still extant population of 20,000,000 horses in this country in spite of motorized traction.

• **PLUTONIUM.**—One branch of the uranium family which is most likely to have industrial significance is plutonium, a man-made element produced by neutron bombardment of the more plentiful but non-exploding isotope of uranium. Relatively stable, plutonium can be separated chemically from the parent uranium and can be exploded under further neutron bombardment. Industrially significant is the fact that scientists working with plutonium have already learned how to control the rate of energy release and it is reported that an experimental (but very costly) boiler installation was in operation on the project.

THOUGHT FOR FUEL

Coal – oil – gas . . . present mixed outlook for winter here and abroad.

• **COAL.**—U. S. bituminous coal requirements for the fuel year ending next March 31 were set in July at 600 million tons and in August modified to 570 to 585 million tons, according to figures released by Secretary of Interior Harold L. Ickes. Mr. Ickes' estimates of the year's possible production remained in both months at 575 million tons contingent on full time work by all miners working at the time of each statement. If miners are drafted or go on a five day week, says Mr. Ickes, we can't hope to make even a reasonable showing. At the same time it is proposed to ship six to eight million tons of bituminous coal to Europe.

Coal for Europe is not so much a matter of benevolent American self denial as it is a realistic effort to keep European wheels turning and European markets open. The world problem concerns anarchy, morale, and cork (H&V, Aug. '45) and boils down to the equating of purchasing power on both sides of the Atlantic.

In this connection, it is notable that the proposed eight million U. S. tons will be fractional in coping with a 20 million ton European shortage. It is regarded here as more or less of a pump primer in view of the fact that German mines, while producing only 17% of normal have already 50% of pre-war miners returned to work. Production in Netherlands mines, too, can be expected to improve with new equipment and better living conditions.

As for domestic consumption, there is little prospect that victory over the Japanese will affect the bituminous picture materially. For the present, the 80% quotas set on home heating sizes of coals produced in the East will be maintained. However, users of the so-called steam sizes of eastern bituminous and all users of midwestern and western coals will probably get 100% of their requirements.

• **OIL.**—The return of Big Inch and Little Big Inch to civilian petroleum transportation, the lessening of demands for the Pacific, and the release of tankers for coastwise oil transport have served to brighten the civilian petroleum outlook considerably. In spite of an anticipated increase in civilian consumption as a result of the lifting of rationing, the overall consumption is expected to show a net decrease. Eased transportation has resulted in a lowering of price ceilings on gasoline and fuel oils along the eastern seaboard. Prices are to be lowered by amounts representing in general the increases in ceilings granted during the war to help defray extra wartime transportation costs. A proposal to use the "Inch" pipelines to transport natural gas may stir up a hornet's nest among eastern coal men and western oil men while tanker oil companies hope to undersell pipe line deliveries to the East.

• **GAS.**—All war restrictions on the acceptance of all types of additional residential space heating and the industrial consumption of gas by utility companies have been removed by the Office of War Utilities, WPB.

In the meantime, development of a new process for utilization of lignite for gas has been worked out by the Bureau of Mines and the University of North Dakota. The development is the Parry retort for carbonization and gasification of non-coking coals and oil shales originated by the bureau's V. F. Parry. Experience gained independently at the University of Minnesota by Dr. Lloyd L. Ryerson, professor of chemistry, has been built into the commercial size unit on the North Dakota campus.

The object of work on the process is not only to provide gas for fuel but also to use the high-hydrogen gas produced from North Dakota's lignite in the beneficiation of Minnesota's low grade iron ores. With modification, Parry's retort can produce either a gas for commercial consumption or a gas suitable for conversion to liquid fuels with a yield as high as 50 gal of gasoline from a ton of sub-bituminous coal.

KITCHEN HOODS STUDIED

AGA seeks optimum hood design for kitchen ventilation.

• **MODERN DESIGN.**—A review of current research in kitchen ventilation by the American Gas Association was presented by R. C. Gregg, assistant chief research engineer of the A.G.A.'s Cleveland laboratories, at a two-day West Coast conference on domestic gas research held in Los Angeles.

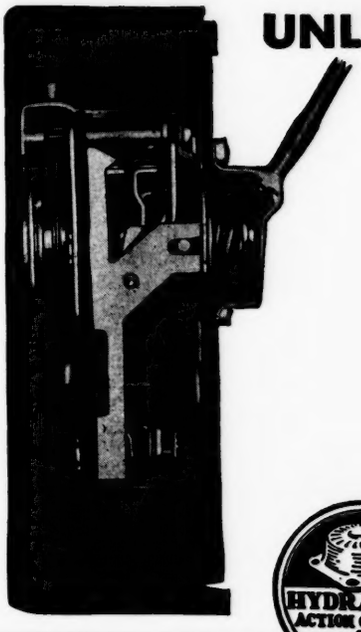
Mr. Gregg pointed out that the present building trend is toward greater numbers of small homes with correspondingly compact kitchens. In keeping with this trend and to take full advantage of reduced space, he said, the entire kitchen is being modernized in appearance and utility and the various trends are being coordinated into a harmonious gas kitchen unit.

In addition to the standardization of dimensions and

★ HEAVIER, *LONGER-WEARING* PARTS

possible because of

UNLIMITED POWER OF HYDRAULIC-ACTION



With the terrific power of Hydraulic-Action to actuate the control, tough, strong, hard-driving parts can be built into White-Rodgers temperature controls.

That means a control with long life, free from trouble calls due to breakage or adjustment needs. Under even the hardest, roughest use, White-Rodgers Hydraulic-Action controls can take it and come back for more.

HYDRAULIC ACTION CONTROL

8 EXCLUSIVE FEATURES OF WHITE-RODGERS HYDRAULIC-ACTION TEMPERATURE CONTROLS

1. May be mounted at any angle or position, above, below or on level with control point.

2. Hydraulic-Action principle incorporating solid-liquid-filled bulb and capillary provides expansion force comparable to that of a metal bar.

3. Diaphragm motion uniform per degree of temperature change.

4. Power of solid-liquid charge permits unusually sturdy switch construction resulting in positive contact closure.

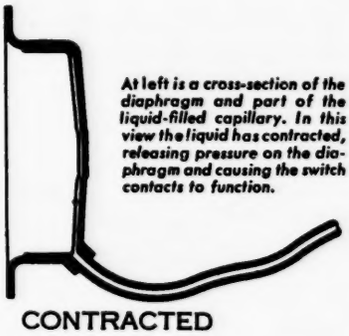
★ 5. Heavier, longer-wearing parts are possible because of unlimited power.

6. Dials are evenly and accurately calibrated over their entire range because of straight-line expansion.

7. Controls with remote bulb and capillary are not sensitive to change in room temperature. Accuracy of control is not affected by temperature changes in surrounding area.

8. Not affected by atmospheric pressure. Works accurately at sea level or in the stratosphere without compensation or adjustment.

WHY HYDRAULIC-ACTION CONTROLS ARE *LONGER-WEARING* UNDER HARDEST USE

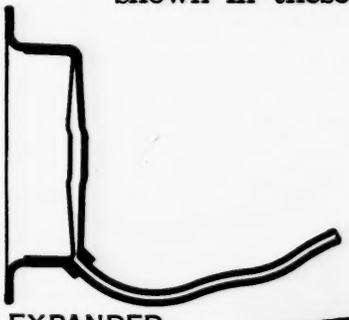


At left is a cross-section of the diaphragm and part of the liquid-filled capillary. In this view the liquid has contracted, releasing pressure on the diaphragm and causing the switch contacts to function.

CONTRACTED

The amazing expansive and contracting force of the Hydraulic-Action solid-liquid charge is responsible for its long-wearing dependability in service. How this works is shown in these illustrations.

In this cross-sectional view, the liquid charge of the capillary has expanded with a rise in temperature. The positive force of this hydraulic action forces the diaphragm outward and causes the switch contacts to function.



EXPANDED

Actual-size illustration of the White-Rodgers diaphragm body, the actuating element of every White-Rodgers temperature control. It is so designed as to exert full pressure at the point of contact with the switch mechanism.

WHITE-RODGERS ELECTRIC CO.

1207J CASS AVENUE **ST. LOUIS 6, MISSOURI**

Controls for Refrigeration • Heating • Air-Conditioning

promotional phases of the A.G.A. kitchen program, considerable attention has been given to the important feature of kitchen ventilation, Mr. Gregg reported.

The need for advancement in ventilation technique has been intensified by the necessity for keeping abreast with modern concepts of kitchen design requiring something better than the use of unsightly hoods or conventional ventilation fans installed in the wall, Mr. Gregg declared.

• **FUNDAMENTALS.**—Studies covering the fundamentals of kitchen ventilation together with the exploration of possibilities for effective and coordinated ventilating assemblies which were undertaken by the A.G.A. laboratories in May, 1944, to date have entailed removal of excess heat, moisture and cooking odors resulting from operation of the domestic gas range, and phases of kitchen ventilation relating to removal of grease and the operation of gas refrigerators, Mr. Gregg reported.

Mr. Gregg described various tests that were made at the Cleveland laboratories with a cabinet type hood located above the range and connected to a rectangular duct at the top, which type of hood, he said, indicated great possibilities from the standpoint of appearance and standardization of assembly. An extensive investigation of the performance of this hood under various conditions was conducted, as well as tests with a modified wall type hood and a full canopy type hood.

• **RESULTS.**—Comparative efficiencies of heat removal obtained with different adaptations of a lower wall type hood were presented by Mr. Gregg in table form, as follows:

Type of Hood Opening, Inches	Height Above Cooking Top, Inches	Air Withdrawal, Cfm	Number of Burners in Operation	Percent of Heat Removed
2—4x9½	10	300	2 front and oven	25.0
2—4x9½	10	560	2 front and oven	53.0
1—36x2	18	296	2 front and oven	26.0
1—36x2	18	567	2 front and oven	50.0
1—36x2	14¾	280	2 front and oven	25.3
1—36x2	14¾	580	2 front and oven	54.1

In his summary, Mr. Gregg declared that, from information obtained to date, it appears that the effectiveness of ventilating a kitchen from the standpoint of removal of excess heat, moisture and cooking odors is highly dependent upon the rate of air withdrawal.

Results of tests indicate, he stated, that, based on the assumption that 300 cfm is the maximum practical rate of air withdrawal, a cabinet type ventilating hood offers good possibilities from the overall standpoints of appearance, performance and simplicity of design and installation. Removal of moisture, according to Mr. Gregg's findings, is comparatively easy since practically all moisture produced by rear top burners and the oven can be removed with any of the three types of hoods studied. With the cabinet type of hood, removal of approximately 70 to 80% of the moisture produced by the front top burners can be effected, he said.

Although all odors cannot be removed from the kitchen even with very high rates of air withdrawal, Mr. Gregg asserted that proper ventilation aids materially in confining the odors to the kitchen.

In addition to studies made to date, Mr. Gregg cautioned that two additional factors must be borne in mind.

1. Although hood ventilators do not instantly remove all heat generated by cooking operations, at least they cause a deflection of heat away from the person standing near the range or elsewhere in the kitchen, while conventional type ventilators may cause the opposite to happen.

2. Hood ventilators have the important advantage, not normally possessed by conventional fans, of preventing the release of grease-laden vapors into the kitchen, thereby reducing upkeep of wall and kitchen surfaces.

AIR CONDITIONED TROLLEY COACH

Atlanta gets first air conditioned trolley coach made for city traffic.

• **EXPERIMENT.**—An air conditioned trolley coach—the first ever built for local city transportation—has been delivered to the Georgia Power Co. for use in Atlanta, Ga. The test coach was built at the Worcester, Mass., plant of the Pullman-Standard Mfg. Co., and the Georgia power company will operate it experimentally to determine its practicability. Although the air conditioning equipment weighs about 1,500 lb, the test model is similar in appearance to other trackless trolleys now operating in 43 cities (said to be America's fastest growing mode of intra-city transportation).

• **HEAVY COOLING LOAD.**—The cooling and dehumidifying capacity of equipment in the coach is about twice that required for inter-city buses. This is because of the heavy concentration of passengers and the frequent opening of doors in local operation.

Conditioned air is distributed through ducts passing down both sides of the coach from the ceiling. The equipment, designed by the Carrier Corp., Syracuse, N. Y., will deliver 800 cfm of outside air for ventilation, and fans will also circulate 2,200 cfm of cooled, dry air.

THE SUN HOUSE

Libbey-Owens-Ford and Canadian affiliate sponsor test houses designed and built to study effects of design on solar heat gain.

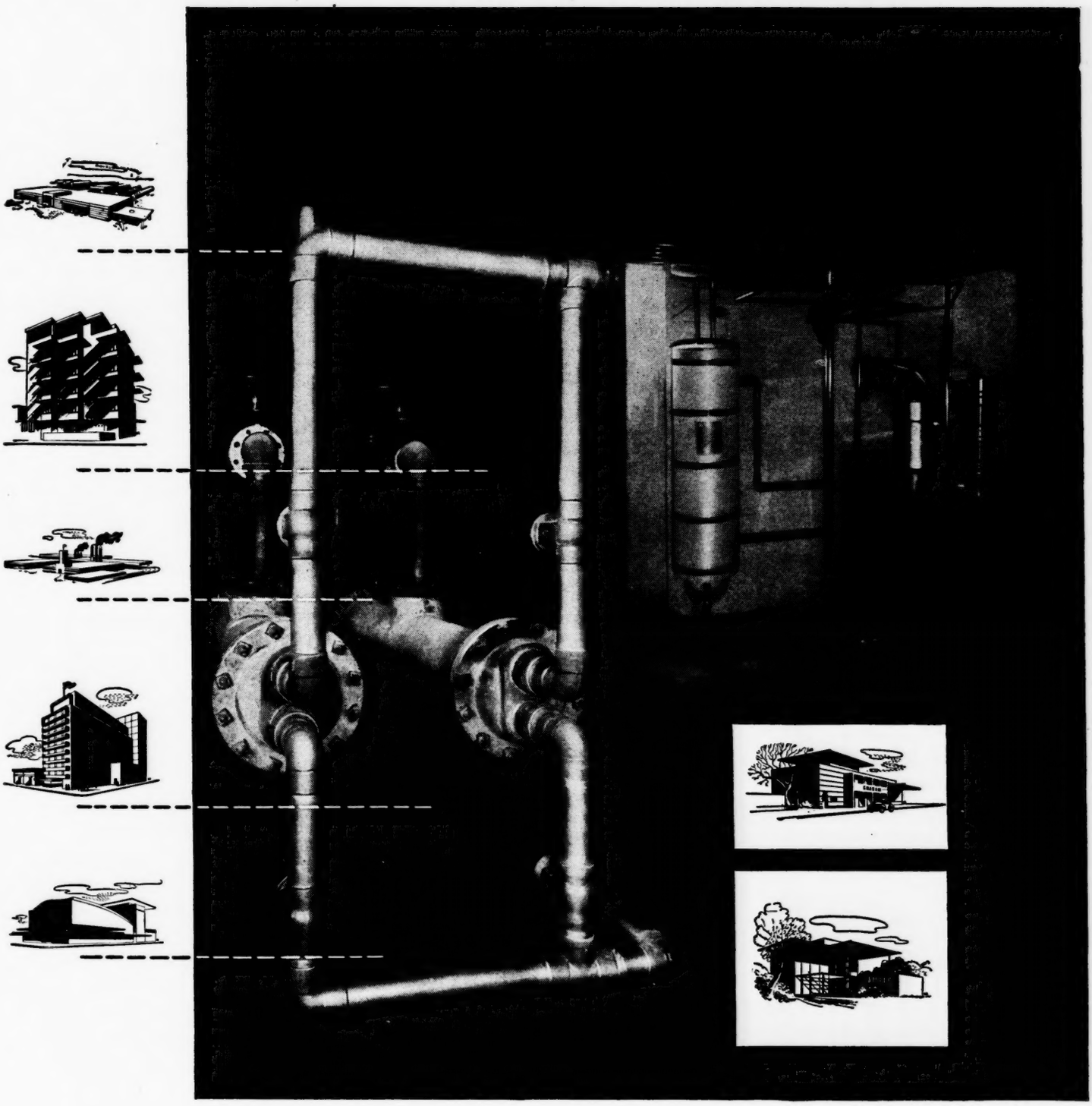
• **SUN HEAT.**—Socrates, over 2,000 years ago, said: "Now in houses with a southern exposure, the sun's rays penetrate the porticos in winter, but in summer, being less inclined, they afford us shade. If then this is the best arrangement, we should build the south side loftier to get the winter sun and the north side lower to keep out the cold winds." Thus quotes F. W. Chambers, Toronto consulting engineer, reporting on the Hobbs Sun House.

The Hobbs Sun House is being built in Toronto by Hobbs Glass Limited, Canadian affiliate of Libby-Owens-Ford. A second L-O-F sponsored project is the pair of test houses constructed at Lafayette, Indiana, in cooperation with the Housing Research Division of the Purdue Research Foundation. (See the article by F. W. Hutchinson in this issue.)

In the Hobbs house, solar heat is used when available to supplement radiant heat from floor panels. According to Mr. Chambers, sun houses, from the standpoint of heating, fall into two groups:

(1) Those which have all the principal rooms facing south with a connecting corridor or hallway as a buffer on the north side, and

(2) Those which have a solar zone on the south and a non-solar zone on the north side of the building. The Hobbs sun house is of the latter type with breakfast room-kitchen, living-dining room, master bedroom and dressing room comprising the solar zone while the balance of the house is considered



COPPER MAKES ANY BUILDING BETTER

No matter how you look at it, a copper tube installation improves a building. Not only by keeping heating and water lines clean on the inside—for unobstructed flow and clear water—but also by slowing depreciation. Any open-minded owner will easily understand why the use of copper lines saves him money. What's good for buildings and their owners is good for the engineer and contractor. You can rely on copper to back up your professional reputation.

Revere Copper Tube (99.9% pure copper) is seamless and is cold drawn with a gun-barrel finish inside. It is deoxidized, and is free from flaws and blemishes. Joints are made with either soldered or compression fittings.

Designed for heating, air conditioning, water supply and other services, this tube is stamped with the Revere name and the type at regular intervals. Look for these identification marks—they insure full wall thickness and the close gauge tolerances that are so necessary for tight sweated joints.

In making your plans you can specify such Revere materials as copper tube and pipe; Red-Brass pipe; sheet copper for tanks, ducts, pans and trays; sheet Herculoy for tanks; Dryseal copper refrigeration tube (dehydrated and sealed); copper oil burner, heat control and capillary tubes.

Revere materials are handled by Revere distributors in all parts of the country. The Revere Technical Advisory Service, Architectural, is always ready to serve you. Call Revere.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

Executive Offices: 230 Park Ave., New York 17, N.Y.

non-solar. The two sections are considered separately so far as heat distribution and control are concerned.

• **BOILER ROOM.**—There is no basement in the Hobbs sun house, and the automatic, gas fired, hot water boiler is placed in the attic. Less than 17 in. wide, it is set in an opening in the middle of the chimney where there was ample space available and where the heavy chimney construction made an excellent foundation. Short brick extensions with fire-proof doors at each end make a compact boiler room with a separate outside air supply.

• **FLOOR PANELS.**—Radiant floor panels in the Hobbs house are made up of serpentine pipe coils embedded in the concrete slab floor. The floor surface temperature averages 80F. Temperature of water circulated through the coils is varied according to outside temperature and so controlled as to maintain a building temperature of 60F. The balance of the heat required to maintain the desired day temperature of 68F is supplied by ventilation air.

• **VENTILATION.**—To keep housework and dusting at a minimum, large Thermopane windows are permanently fitted in their sash and all ventilation air is supplied mechanically.

The conditioner unit and all ductwork as well as the roof are aluminum. The conditioning unit which supplies the ventilation air is of simple though slightly unusual design. It is located in the attic space above the utility room. The air circulated is a mixture of outside and recirculated air, the proportion of outside air being adjusted by setting of a dial. Solar heat that would tend to overheat the Solar rooms is utilized with the recirculated air to temper the incoming air.

The mixture of outside and recirculated air is drawn through an air cleaner of the electric type. After being cleaned the air is blown into two ducts. The warm air supply duct has a heater coil in it which tempers the air to a temperature which varies from 80F when the outside temperature is 55F to 110F when it is —10F outside. The other or cool air duct carries air at about 60F. When mechanical refrigeration is again available a cooling coil for summer operation will be installed in the cool air supply duct. Branch connections are taken from both ducts to supply air to each zone and a thermostatically controlled damper mixes the warm and cool air so that while always supplying the quantity of air required for ventilation, the temperature of this ventilation air will be varied so as to maintain the desired temperature in the zone. With this arrangement it is possible simultaneously to heat a zone on the north side of the house while preventing overheating due to excessive solar radiation on the south.

• **EXHAUST AIR HEATS GARAGE.**—With fixed windows there is no leakage of air around the window sash and whenever outside air is being supplied it is necessary either to remove air or allow an equal quantity to escape. In the Hobbs sun house this air is exhausted mechanically, and to make sure that no heat is wasted, part of this exhaust air is blown into the garage while the balance is blown through a series of tile ducts below the garage floor and extending under the driveway before being exhausted. These air heated panels will keep the garage floor dry and will assist in keeping the driveway clear of ice and snow during the winter.

• **THE FIREPLACE.**—The fireplace of the sun house deserves special mention. It is similar to a glass stove with tight doors of armoured glass. It has a separate air supply from outside, so that no air for combustion is taken from the house and therefore the fireplace cannot cause the unpleasant floor drafts frequently associated with fireplace installations.

Because the sun house fireplace is in the partition between the living room and the recreation room, openings were left on both sides so that the fireplace faces both rooms although it will be fired and cleaned from the recreation room side. The armoured glass door on the living room side is transparent while those on the recreation room side are translucent. To minimize smoking of the glass a gas jet is used to ignite the wood fire.

• **PROVING GROUND.**—The Sun House is the proving ground for testing ideas and developing techniques now, for the benefit of all those planning to build a home of more modest proportions in the post-war period.

CLOTHING IS INSULATION

Military-uniform requirements in global war have sponsored further study of the human body as a thermal system.

• **WHY.**—For fighting men in every corner of the globe, it was necessary for the United States Army Quartermaster Corps to plan and provide uniforms suitable for combat under every conceivable combination of climate and activity. It was not practicable simply to pile clothing on a soldier's back until he said he was comfortable. Therefore, research was brought to bear on the problem of predicting the insulation values of clothing necessary to maintain military activities under conditions met in the field.

• **WHAT.**—Establishment of military clothing standards has been predicated on the fact that the human body is a thermal system of measurable factors, operating under predictable conditions. Balancing a physiological heat supply with heat losses differs from the ordinary commercial engineering problem only in being its reciprocal. That is, clothing, as insulation, is designed to control losses from a relatively fixed heat supply; the commercial engineer designs a heat supply to balance predictable heat losses.

• **HOW.**—In order to unify investigations and at the same time to express findings in practicable terms, a unit of insulation called a clo has been adopted widely. One clo is defined as the insulation necessary to maintain in comfort a sitting, resting subject in a normally ventilated room at a temperature of 70F and a humidity of less than 50%. In metric units, 1 clo is equal to 0.18 degrees centigrade per cal per sq m per hr.

Work at the Harvard Fatigue Laboratory, as reported in publications of the National Research Council, points out that the heat loss through a clothing assembly must be equivalent to the sum of the metabolic heat production of the body and whatever heat is lost through cooling of the body tissue after subtraction of heat losses via avenues other than through the clothing. These other avenues include heat loss through the lungs in vaporization of moisture and warming the inspired air and heat loss through vaporization of perspiration at the skin.

After empirical determination of the relationship between body-skin temperatures and comfort, and with due regard to the effects of wind and bodily activity, the clo is put to work in solving such problems as the following: If the temperature is —10F and the wind velocity is 2 mph, what protection is required by a man driving a truck? Or at the same temperature and wind velocity, what protection is required by a sleeping man? When the clo insulation required for complete comfort is determined, it is customary to determine the minimum acceptable clo with reference to tolerance time and

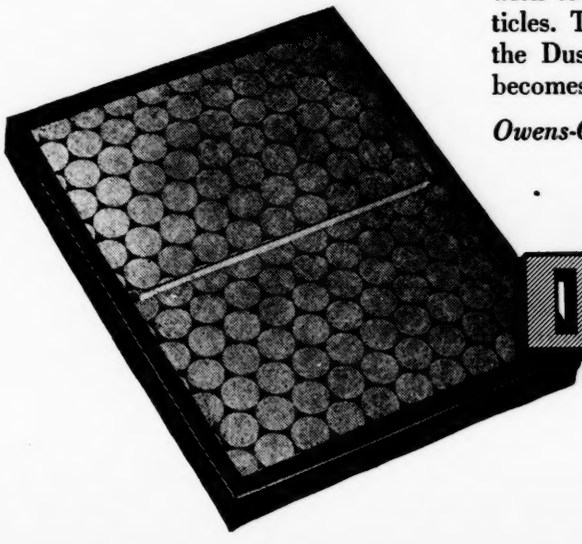
"Just like putting Dust-Stops* in the Bank"

It's an indication of good business judgment when you see banks of Dust-Stop Air Filters in heating and air conditioning systems. It's evidence of good engineering, sound buying and low-cost maintenance that are worth looking into.

It shows up in the President's office.

Where initial cost and upkeep are balanced with the advantages of air filtering efficiency, the use of Dust-Stops shows up on the profit side of the ledger.

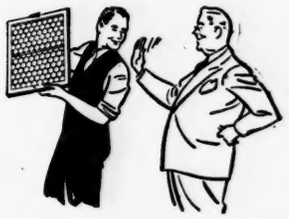
Dust-Stops and the complete, ready-to-assemble steel cell frames are readily adaptable to virtually any system regardless of the C.F.M. required.



The Purchasing Agent scores a hit.

Because Dust-Stops are readily available, at low cost, for easy replacement, the P.A. wins the boss's praise again. The expense, nuisance and other difficulties of laundering are avoided.

The Dust-Stop Air Filter is made of packs of glass fibers coated with an adhesive, faced with metal grilles and bound on the edges with a fiberboard frame. The high efficiency of Dust-Stop Air Filters is made possible by the Fiberglas filter medium and the nonodorous, nonevaporating adhesive. Due to extraordinary wetting power, each particle of dust acts as a wick to carry adhesive to other particles. Therefore, the effectiveness of the Dust-Stop is maintained until it becomes heavily loaded with dust.



The Maintenance Engineer gets a pat on the back.

Maintenance and/or replacement of Dust-Stops in the "L" or "V" frames are accomplished with a minimum of man power and time. There is no storing problem. Dust-Stops can be quickly obtained from near-by suppliers. And the budget is kept to a minimum.

Dust-Stops are used in factories, commercial buildings, schools and institutions from coast to coast—and as components of many types of machines and equipment, they are installed for the protection of precision parts.

For complete information and typical installation details for both "L" type and "V" type frame arrangements, see Sweet's Files or write:

Owens-Corning Fiberglas Corporation, 1912 Nicholas Building, Toledo 1, Ohio.
In Canada, Fiberglas Canada Ltd., Oshawa, Ontario.

DUSTOP AIR FILTERS

*T. M. REG. U. S. PAT. OFF.

ARMY E NAVY

—a FIBERGLAS product

varying activity. For instance, if the truck driver stops once an hour to work at loading or unloading he will need less insulation. Thus, the optimum weight for clothing insulation is established for every situation.

Physical tests of fabrics and other clothing materials are made to determine the clo values of various service-uniform assemblies. These tests involve more than thermal insulation. Such factors as tensile strength, flexibility, permeability, etc., are also considered in matching uniform assemblies to the clo values required by personnel under given climatic conditions.

Army research workers have developed a system of charts showing the clo values of the constituent elements of uniforms, including air spaces, plotted as equivalent inches. Regarding the body as an assembly of cylinders and allowing for variation of efficiency with diameter (as between arm and torso) the clo value of a given uniform as a whole can be read off the completed chart.

• **WHERE.** — For details regarding testing methods, physiological calorimetry, derivations, etc., see "Clothing Test Methods," published by the National Research Council. Work has also been done at an Army project set up under the title, Climatology and Environmental Protection Section, Research and Development Branch, Military Planning Division, Office of the Quartermaster General.

AID TO CONSTRUCTION

U. S. Chamber of Commerce and Producers Council simultaneously adopt policies to improve and coordinate building practice.

• **POLICY BY MAIL.** — Ordinarily, policies of the Chamber of Commerce of the United States are set at an annual meeting. This year, with no possibility of the representatives of its membership of 2000 local chambers of commerce and trade associations and 14,000 firms and individuals meeting in person, the Chamber held a mail referendum on a set of proposals advanced by the Chamber's committee on policy.

Among policies adopted were a number of measures to help the construction industry, including suggestions for building code revisions, financing, housing, public works and taxation, as follows:

• **BUILDING CODES.**—Building regulations and codes should be maintained in step with developments in the industry and obsolete requirements should be eliminated to avoid unnecessary costs to owners.

In revising building codes, standard code provisions which have been prepared through accepted processes and by qualified agencies should be included to effect regional uniformity in building code regulations. The cost of publishing a new code can be materially reduced by referring to published provisions of standard codes, and states should be urged to enact necessary enabling legislation.

• **FEDERAL FINANCE AGENCIES.**—Congress should take steps at once to see to it that the federal home finance agencies regain their relatively independent prewar status. They should not be handicapped by being made a part of either a war housing liquidation activity or of a subsidized rental government housing activity.

• **HOUSING.**—Chambers of Commerce should urge state and local governments to take measures to encourage redevelopment through private activity of slum and blighted urban areas. Private ownership of housing, whether for rental or for owner occupancy, is a basic principle in national economy. Every effort should be made to maintain this principle after the war.

• **PUBLIC WORKS.**—Congressional scrutiny of separate proposals for federal expenditures for public works, including maintenance and upkeep, should be broadened to include careful consideration of the over-all relations between proposed federal expenditures for public works and total expenditures and revenues.

There should be increasing insistence upon state and community responsibility for their public works. Congress should take steps now to adopt such fiscal policies as will not unduly hamper the ability of the states and local governments to carry out their responsibilities in this and in other fields which are properly in their jurisdiction.

Competitive contracts should continue as the accepted basic procedure for securing economy in public construction.

• **TAXATION.**—Because of the difficulties involved in the transition periods, provisions for the carry-forward of losses and other suitable recognition of the principle of averaging incomes over a period of not less than six years forward can make an important practical contribution to effecting more reasonable stability in construction activity.

Engineering and other costs necessarily connected with the predevelopment of postwar construction should be permitted as current operating expense.

• **PRODUCERS COUNCIL.** — Simultaneously with the formation of the foregoing policies, Producers Council, national organization of building material and equipment manufacturers, made public its 11-point program, designed to lower postwar construction costs and stimulate maximum building and employment volume.

This program, presented by L. C. Hart, vice-president of Johns-Manville Sales Corp., and president of the council, is shaped up so that it will give strong support to the construction industry advisory council of the Chamber.

Recognizing that lowered construction costs are of prime importance, the Council believes that substantial reductions can be effected by standardized dimensions, modernization of building materials and techniques.

So that housing construction can proceed along coordinated lines without overbuilding of communities, the Council suggests that honest local housing inventories be taken to determine the number of units to house needy families. Substandard dwellings, in slums and elsewhere, should be replaced.

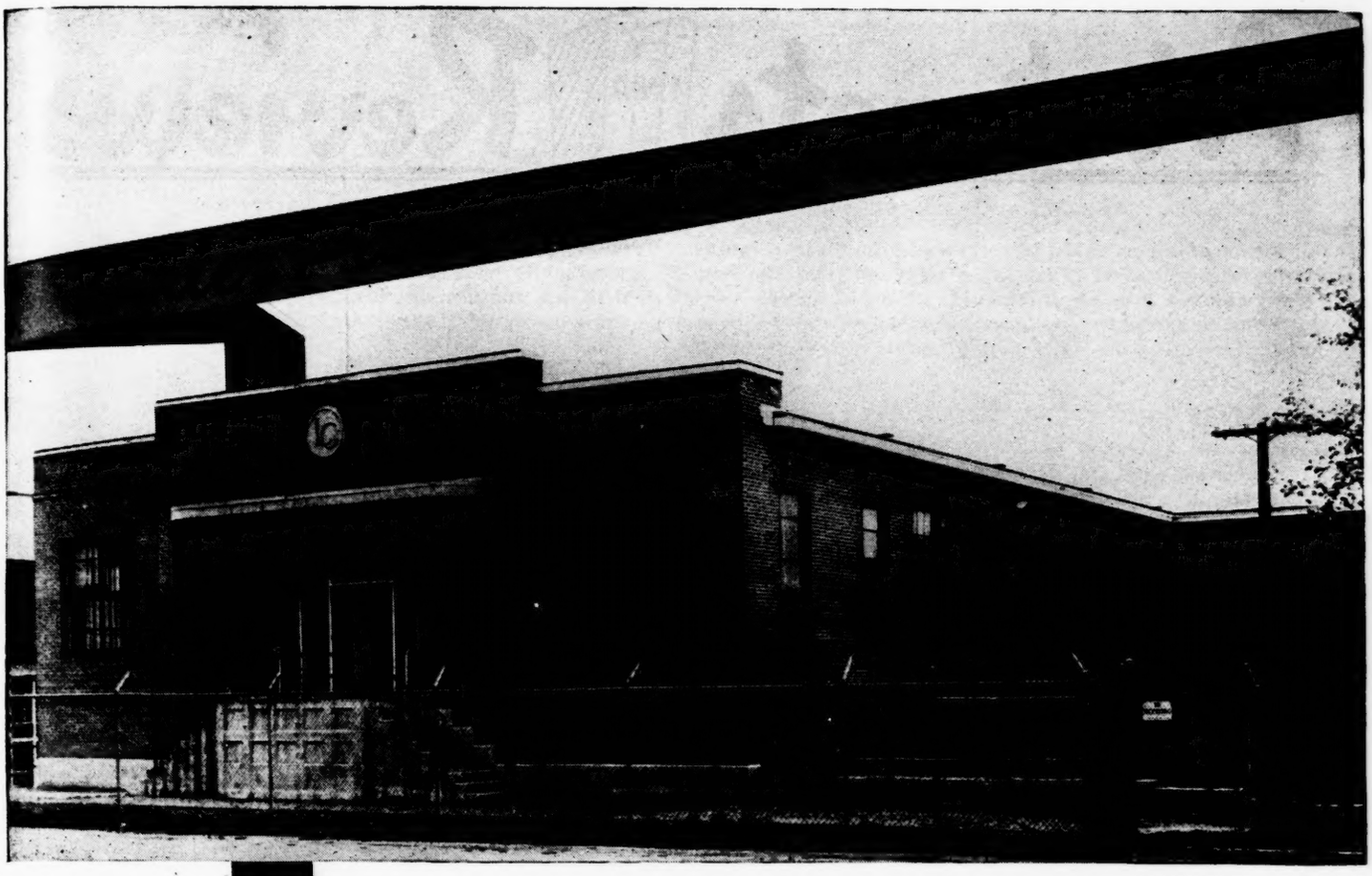
Surplus war products can be utilized to a great extent in postwar building, the Council believes, and it advocates a thorough study of the best manner to get such materials and equipment into trade channels.

Particular stress will be placed on promoting the correct use of building products and educating the public on sound construction practices.

Analysis will be made of building practices, government regulations, financing and all other factors which have an impact on construction as a guide to removing all unnecessary obstacles to a maximum volume of building.

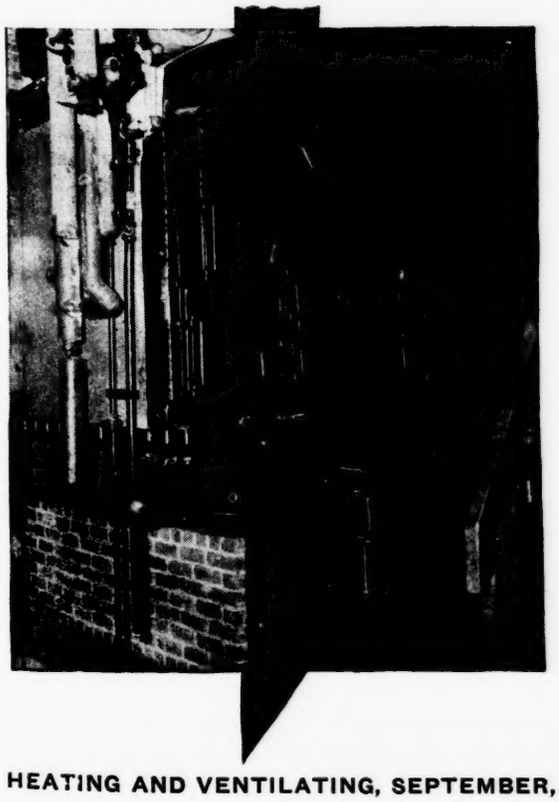
Sizing Steam Mains

In H & V's Reference Data 297-298, July issue, the phrase "per 100 ft" should be omitted from the problems as stated in both the second and third examples. In the first case the pressure drop of 4 ounces is intended to be through the whole system and not per 100 ft, and in the second case, the 2 ounce pressure drop is also intended to extend over the whole main.



The Lombard Governor Corporation of Ashland, Mass., are manufacturers of governors, valves, pumps and other industrial equipment.

This No. 60 Smith oil-fired boiler not only heats Lombard Governor's new plant but furnishes process steam as well. Header type cast-iron construction minimizes breakdown possibilities while assuring lowest maintenance costs.



With most modern small and medium sized factories buying power, it becomes increasingly desirable to install a boiler plant which will operate with maximum flexibility, yet require a minimum of attention. The hundreds of H. B. SMITH cast-iron boilers installed in factories during the war years provide the answer to this problem.

Operating efficiently with oil, coal or gas, H. B. SMITH boilers not only handle heating loads but in many cases take care of process steam, air conditioning units and domestic hot water as well.

Architects, engineers and contractors who will be judged by the operation of the equipment they recommend will do well to profit by these war-time experiences and specify a known quantity in boiler performance . . . H. B. SMITH.

H.B. Smith

CAST-IRON BOILERS

THE H. B. SMITH COMPANY, INC., WESTFIELD, MASS.

Branch Offices and Sales Representatives in Principal Cities

Abstracts AND Reviews

Books of other publishers reviewed in these columns may be purchased at list price through HEATING AND VENTILATING, *Book Department. Other items, such as articles or pamphlets reviewed, should be obtained from original publishers whose street addresses are shown.*

PLASTICS

Few new materials have excited as much popular interest as plastics and as a result there has been a demand for detailed data regarding these synthetic materials. J. H. Dubois in his book Plastics has aimed to produce a textbook that will also serve as a reference book. This objective he has achieved, and in a sense has succeeded in writing a book that meets popular demand. The first edition has gone through 3 printings, the second edition, 2 printings, and it is now revised and presented as the third edition.

Each of the types of plastics is discussed in detail and chapters are presented on the design of plastics and technical applications. It even contains material on synthetic rubber, low pressure laminating, and trends and developments.

It is recommended for the engineer who has no knowledge of plastics and wishes to become acquainted with this material, and it will also serve as a reference book for those who want specific information.

Plastics by J. H. Dubois. Cloth bound, 6x8, 447 pages. Published by American Technical Society, Chicago. Price, $4.

BUSINESS ADMINISTRATION

Extensive use of the check list is employed by J. K. Lasser in his Business Executive's Guide. Check lists are given on many problems, from those involved in setting-up, buying or selling a business to cutting down office costs and the purchasing of printing. The author has used the check list as a thread to guide the executive who wishes to be free from important details and from the worry that some basic point may have been overlooked.

The 42 chapters or check lists are grouped under the three main heads of organization, finance and office administration.

Mr. Lasser is well known to business executives for his books, "Your Income Tax," and "Your Corporation Tax."

Business Executive's Guide by J. K. Lasser. Cloth bound, 5x8 in., 252 pages. Published by McGraw-Hill Book Co., New York City. Price, $3.

FUEL CONSERVATION IN HOSPITALS

To better acquaint hospitals on how to get the most out of fuels, Dr. Warren P. Morrill, Director of Research for the American Hospital Association has issued "Fuel Conservation in Hospitals."

It is believed that hospitals do not average more than 40 cents use out of each fuel dollar. Losses are equally divided between inefficiency in the production of steam and wastes in its distribution and use. The hospital power plant is one department that is most susceptible of improvement in economy in the entire hospital. Fuel conservation is also particularly timely at the present time because of the fuel shortages.

The author covers such points as the selection and purchase of fuel, combustion, steam production, instrument control methods and steam consumption. The subject, while well covered, will prove elementary for one with an engineering background. It should prove of value as a guide to the administrative staffs of hospitals.

Paper cover, 6x9 in., 62 pages. Published by American Hospital Association, Chicago. Price, paper cover, 75 cents; cloth bound, $1.50.

IN BRIEF

CHLORINE.—Second in the series of bulletins on Controlling Chemical Hazards, issued by the Division of Labor Standards, U. S. Department of Labor, is on Chlorine. The first discussed ammonia. Others to be published soon are on sulfuric and nitric acids, formaldehyde, and the anilines. Besides outlining the hazards, the 16-page booklet gives methods for controlling these hazards. Orders up to 25 copies sent free by writing to the division, Washington 25, D. C.

PIPE AND TUBE BENDING.—Practical methods for bending pipe and tubes of copper, brass and related alloys are described in the Pipe and Tube Bending Handbook. In addition to bending methods, it describes some of the pipe bending equipment. There are 34 pages of tables on pipe and tube data giving weights and properties for copper, brass and alloys. Available from Copper & Brass Research Assn., 420 Lexington Ave., New York 17, N. Y.

ELECTRIC ARC WELDING.—A comprehensive bibliography on this subject has been prepared by the Research and Standards Branch of the Bureau of Ships, Navy Department, Washington 25, D. C. The 127-page mimeographed report is divided into four parts. The first section is a concise bibliography of references to articles written earlier than 1935 on the theory and characteristics of the electric arc. Part 2 is an annotated bibliography of material from 1935 to date with special reference to the welding arc, in air and in atomic hydrogen. Parts 3 and 4 are lists of welding research projects and of welding codes. Where a foreign article is listed, an English translation of its title is given.

IMPROVING STOKER OPERATION.—As a means of improving results obtained from domestic stokers, two small instruction booklets are available. Booklet No. 1 is "Effect of Stack Damper Setting or Furnace Draft on Stoker Performance," and contains 16 pages. Booklet No. 2, of 32 pages, is on "Effect of Air Regulation on Domestic Stoker Performance." It contains photographs to show the results of good and bad air settings. Write to Koppers Coal Division, Eastern Gas and Fuel Associates, Pittsburgh 19, Pa.

HANDLING COPPER TUBING — Under the title, "Tube Trails", a 12-page booklet describing and illustrating the right and wrong ways to bend, cut, flare, and join copper tubing, is published by Wolverine Tube. The booklet is pocket size and dedicated "to the refrigeration service man, his trips a-field and the 'tube trails' he leaves behind him." Copies may be obtained from Wolverine Tube Division, Calumet and Hecla Consolidated Copper Co., 1411 Central Ave., Detroit 9, Mich.

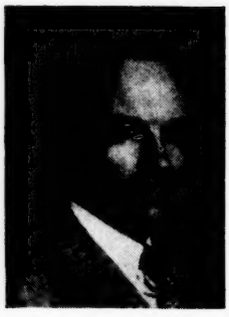
GOOD LOOKS are more than skin deep with BETHLEHEM GALVANIZED SHEETS

GOOD LOOKS, of course, add a lot, when you use bright, full-spangled Bethlehem Galvanized Sheets for a piping or ductwork job. Their attractive appearance helps convince the customer that the job has been well done—and a satisfied customer is always good advertising.

This is one case where the good looks are more than skin deep. Bethlehem Galvanized Sheets are made from a continuous-rolled product, uniform in gage and size, and tightly coated with high-grade zinc. Result is a galvanized sheet that is ductile, easy to form, bend and solder—one that you can trust to do its job, no matter how exacting.

BETHLEHEM STEEL

Getting Personal



F. G. Hechler

F. G. Hechler *(The Climatometer—an All-Weather Room,* page 65) was born in Missouri and received his M.E. degree from the University of Missouri. He was a member of the staff of the Mechanical Engineering Department of Rensselaer Polytechnic Institute for eight years before going to the U. S. Naval Engineering Experiment Station, Annapolis, Maryland, as Mechanical Engineer in 1916. Shortly after the end of World War I he joined the Vibration Specialty Co. in Philadelphia as General Manager and assisted in the development and introduction of dynamic balancing machines. Since 1923 he has been at The Pennsylvania State College as Professor of Engineering Research and Director of the Engineering Experiment Station. The original thermal laboratory, which became the nucleus of the present extensive facilities of which the Climatometer is a part, was started by L. A. Harding (of Harding and Willard —"Heating, Ventilating and Air Conditioning"), then head of Mechanical Engineering at Penn State. Mr. Hechler is a member of ASTM Committee C-16 on Thermal Insulating Materials; of the ASHVE Technical Advisory Committee on Insulation; a contributor to the A.S.R.E. Data Book; and a member of the Executive Committee of the Oil and Gas Power Division of the ASME.

L. G. Griebling

Louis G. Griebling *(Services for a Research Laboratory,* page 92) is another farm boy who made good. He was born on a farm near Mansfield, Ohio. After completing his high school course, he worked for two years as a machinist before he entered the Carnegie Institute of Technology, Pittsburgh.

Following receipt of his degree of B.S. in Mechanical Engineering, he taught science and mathematics in a high school in Colorado.

In 1928 he got a job in the power plant of The Firestone Tire and Rubber Co., Akron, Ohio, and later was made manager of that department. At present his work covers the engineering involved in power, heating, ventilating and air conditioning in all of the Firestone plants throughout the world.

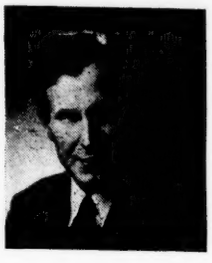
. . . Since the Last Issue

Ed. M. Mittendorff has resigned as vice-president and general manager of **Sarcotherm Controls, Inc.,** and as engineer of **Sarco Co., Inc.** He was connected with both companies since his graduation from Lehigh University in 1928. Mr. Mittendorff is active in engineering circles in Chicago and in 1941 was president of the Illinois Chapter of the A. S. H. & V. E. At the present time he has no definite plans for the future.

C. L. Owens was appointed general sales manager of the **Philip Carey Mfg. Co.,** Cincinnati, Ohio.

First associated with his father's building and contracting company, The F. W. Owens Co. in Louisville, Ky., Owens has been connected with various phases of the building materials field since leaving college. He joined the Carey organization in 1927 as a salesman.

Plans are now complete to turn a large part of the heavy ordnance manufacturing facilities of the **Worthington Pump and Machinery Corp.** plant in Holyoke, Mass., into production of air conditioning and refrigeration equipment. Facilities for the operation have been moved there from the corporation's plant in Harrison. Engineers are concluding designs for a new line of Freon-12 refrigerating compressors. Also to be produced at Holyoke will be a line of air handling equipment including air conditioning units, shower condensers, product coolers, and evaporative coolers in a wide range of sizes and capacities.



C. R. Mougey

Promotion of **Charles R. Mougey** to the post of advertising manager of **Airtemp Division, Chrysler Corporation,** is announced by the company. A former director of the Columbus Advertising Club and member of its war advertising council, Mr. Mougey has been at Airtemp as assistant advertising manager since Oct., 1944. Before that time, he served 10 years with the Ohio Fuel Gas Company as assistant advertising director. Prior experience includes work as publisher and editor of house organs, staff work at advertising agencies, and as a manufacturer's representative. He is a native of Portsmouth, O., and was graduated from Ohio State University.

R. W. McLaughlin has joined **Carrier Corp.** as assistant director of development in charge of the heavy machinery engineering section. Mr. McLaughlin's chief assignment has to do with supervision of design and development for centrifugal compressors used in large refrigeration and air conditioning installations. Prior to joining the Carrier organization, he was chief engineer of the blower and supercharger division of the Elliott Co. in Jeanette, Pa.

American Engineering Company, Philadelphia, announces the appointment of the **Mid-West Heat Service,** 3336 Franklin Blvd., Chicago 24, Ill., to represent the company in northern Illinois and Indiana, including the Chicago Metropolitan District.

R. W. Morgan

Robert W. Morgan has been appointed chief engineer of the **Fedders Manufacturing Co., Inc.,** of Buffalo, N. Y. Mr. Morgan will direct all engineering activities while the Fedders line of products is being expanded for post-war markets covering household and commercial refrigeration, heating, air conditioning, water cooling, automotive radiators, engine and oil coolers for aircraft and other allied products. Mr. Morgan received his degree at Rensselaer Polytechnic Institute and his master's degree at Massachusetts Institute of Technology. His experience covers a broad variety of products in the heat transfer and general manufacturing fields.

Have you checked your Steam Heating System?

If you have not prepared for the winter months just ahead, repair or replace worn or obsolete steam-wasting units *now* before the peak of the seasonal rush arrives, with its confusion and delays.

Modernize with ILLINOIS Specialties

Equip your radiators with smooth-acting Illinois Supply Valves and sensitive, steam-tight Illinois Thermo Traps.

Improve system operation by replacing thermostatic drip traps with Illinois Float and Thermostatic Traps, wherever rapid elimination of condensate is essential.

You can also enjoy the further comfort, convenience and economy of fully automatic control at low cost, by adding Illinois Selective Pressure Controls to your present system.

Investigate these latest developments and refinements in heating system control now available.

ILLINOIS ENGINEERING COMPANY
INCORPORATED 1900
RACINE AVENUE AT 21ST STREET • CHICAGO 8

Formation of new division known as the Commercial Controls Department with **John E. Haines** as manager, has been announced by C. B. Sweatt, vice-president, **Minneapolis-Honeywell Regulator Co.** As part of the reorganization of the company's sales department, those sales divisions which are more concerned with commercial type of controls have now been brought under supervision of the new department, he said. Mr. Haines, who until his new appointment had been manager of the company's Air Conditioning Controls Division, joined Minneapolis-Honeywell in August, 1929. A graduate of Purdue University, where he received his degree in chemical engineering, Mr. Haines became assistant manager of the Moduflow Division in 1934 and subsequently served as manager of the National Regulator Division until his appointment to the Air Conditioning Controls Division in 1940. He is a member of the American Society of Heating and Ventilating Engineers. The Commercial Controls Department encompasses six sales divisions of the Company, Mr. Sweatt said. Those are: Air Conditioning Controls Division, Moduflow Division, Railway Controls Division, Apartment Controls Division, Refrigeration Controls Division and the Aeronautical Division.

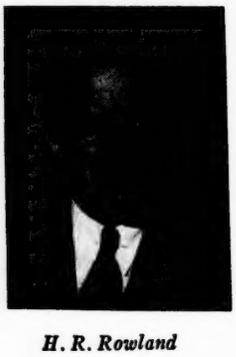
J. E. Haines

At the time of the announcement, Mr. Sweatt also announced the promotion of two new zone managers in the Air Conditioning Controls Division. They are **H. R. Canoyer,** as sales manager of the central zone with headquarters in Cleveland, and **M. S. Hamilton,** as sales manager of the southeastern zone with headquarters in Atlanta.

William B. duPont, manager of the Industrial Division of the **National Radiator Co.,** Johnstown, Pa., died in the Mercy Hospital in that city on August 9 after a short illness. He was 31 years old.

Mr. duPont graduated from the Massachusetts Institute of Technology in 1936 and became associated with National Radiator in 1939.

Robert H. Gardner has been appointed general manager of sales of **A. M. Byers Co.** Mr. Gardner has been manager of Byers' Washington office since 1933, except for a four-year period ending in 1940 during which he was manager of the company's steel pipe sales, with headquarters in Pittsburgh. He takes over the duties of the late Myron J. Czarniecki, who died June 18. Prior to coming with Byers, Mr. Gardner was assistant sales manager of Caterpillar Tractor Company.



H. R. Rowland

R. H. Gardner

At the same time, the appointment of **H. R. Rowland** as assistant general manager of sales was announced. Mr. Rowland joined the company's sales department in 1915. In 1925 he became manager of the Pittsburgh division, and in 1944 was named manager of hot rolled sales.

Hoffman Specialty Co., Indianapolis, announces the return of **Frank H. Gaylord** as vice-president in charge of market development of the company. During the past year Mr. Gaylord has been associated with Economy Pumps, Inc., Hamilton, Ohio, as commercial vice-president, devoting most of his time to a comprehensive study of the industrial and municipal pump field. Before undertaking this special study for Economy, Mr. Gaylord spent twenty-five years with the Hoffman Specialty Co. as supervisor of western territories, vice-president and director. In returning to the Hoffman Specialty Co. Mr. Gaylord resumes his personal contacts with leading heating and plumbing wholesalers, contractors, architects, and other tradesmen selling and installing the Hoffman line of valves, traps and hot water controlled heat but also will continue promoting interests of the Hoffman-Economy vacuum and condensation pumps made for Hoffman by Economy.

E. N. Sanbern

C. W. Little

F. H. Gaylord

Hoffman also announces the appointment of **C. W. Little** as assistant general sales manager. Since October 1939, he has been with Hoffman as zone manager of the New England and New York state area.

A newly created Hoffman Jobbed Products Division is being headed by **E. Nute Sanbern** as manager. Hoffman wholesalers, contractors and architects will benefit from a broad-scoped educational and sales program being readied by Mr. Sanbern in exploiting all special items made for Hoffman. Mr. Sanbern has been associated with Hoffman Specialty Co. for a period of eleven years and his fine engineering background especially fits him for this new and bigger sales work.

The appointment of **Ross & Witmer, Inc.,** as **Carrier Corporation** dealers in Charlotte, North Carolina, is announced. **F. H. Ross, Sr.** will be president of Ross & Witmer, Inc., at the same time retaining his interests in his own company, the F. H. Ross Manufacturing Company in Charlotte. **C. N. Witmer,** who has been connected with Carrier for fifteen years in their New York, Philadelphia, Dallas, Houston, and Atlanta offices, will now make his headquarters in Charlotte with the newly-formed dealership.

The **H. B. Smith Co.** has appointed **Dwyer-Scott Co.** as representative for The H. B. Smith boilers in the Rochester-New York area.

Penn Electric Switch Co., Goshen, Ind., announces the addition of **Lester D. Linehan** as sales engineer for the company's Chicago office, 520 N. Michigan Ave

Educated at the University of Illinois and Armour Institute of Technology, Linehan was a heating sales engineer for 15 years for the Peoples Gas Co. in Chicago. Previous to joining Penn, he was a field engineer for two years with U. S. Electrical Motors, Inc.

Penn manufactures automatic controls for heating, refrigeration and air compressor service as well as certain safety controls.

L. D. Linehan

Plan Now FOR NEXT SEASON'S HEATING REQUIREMENTS

Now is the time to be planning your heating needs for next season. There is an Airtherm Unit Heater to properly, efficiently heat any plant with a saving in fuel.

AIRTHERM PROPELLER TYPE STEAM UNIT HEATERS

Airtherm Steam Unit Heaters are individually controlled. They provide heat only where you want it, and when you want it. They are available in both vertical delivery and horizontal delivery types for ceiling or wall mount.

AIRTHERM BLOWER TYPE STEAM UNIT HEATERS

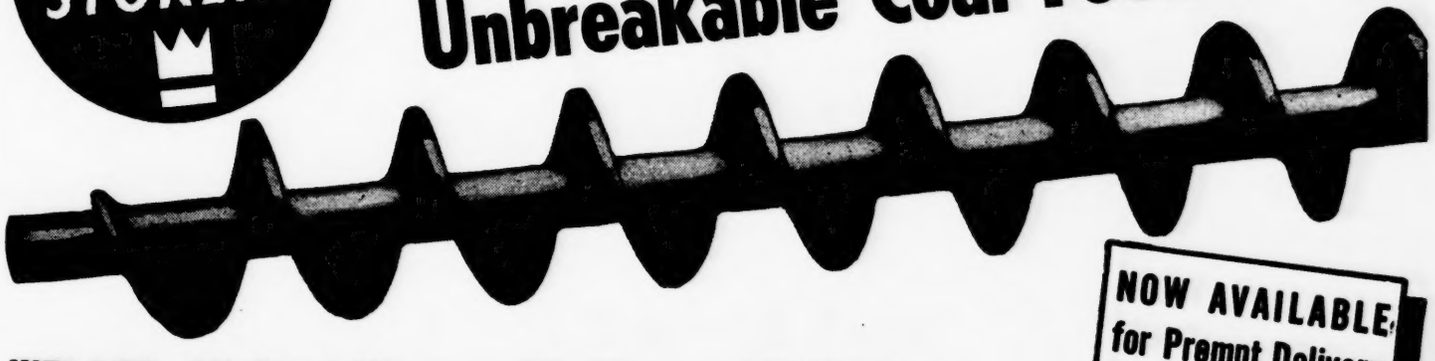
A high velocity unit which assures uniform temperature distribution and maximum heat flow effecting savings in both fuel and maintenance cost. This Airtherm Unit is suited to duct installation. Capacities range from 216,000 to 825,000 b.t.u.

Send us your specifications now. Our engineering department is at your service.

AIRTHERM
MANUFACTURING COMPANY
722 South Spring Avenue • St. Louis 10, Missouri

For STOKERS

The CROWN Unbreakable Coal Feed Screw



NOW AVAILABLE for Prompt Delivery

WELDED All-Steel Worm—All Sizes—All Pitches

★Crown's complete line of all-steel Coal Feed Screws meets every replacement and production requirement. Produced for both domestic and industrial stokers. Crown Screws are available with right or left hand screw, in all sizes and pitches, tapered or straight, and in combinations of pitches. Uniformly smooth surfaces insure that coal will flow freely and easily through the flights. Because it is all-steel with continuous weld, the Crown Coal Feed Screw guarantees long, continuous operation with full customer satisfaction. Crown is in a position to make prompt delivery on all sizes.

In ordering give complete specifications on size and design.

CROWN IRON WORKS COMPANY
1207 Tyler St., N. E. *Since 1878* Minneapolis, Minn.

Peerless Pump Division of Food Machinery Corp. has rearranged territorial distribution by the establishment of five sales districts for postwar distribution of water pumps.

Warner G. Vaughan has been appointed Atlantic District Sales Manager, with offices in Suburban Square, Ardmore, Pa. The southeastern territory has been placed under the management of **Charles E. Tierney** with offices in the Blair Building, 215 Church Street, Decatur, Ga. **Edward W. Pierce** will continue in charge of the central territory, and as district sales manager is making his headquarters at the Peerless Canton, Ohio, works. The southwestern territory has for its district sales manager **William E. Griffin** and headquarters are at 122 E. 5th Street, Plainview, Tex. **B. A. Tucker** is Pacific District Sales Manager, with headquarters at 301 West Avenue 26, Los Angeles, Calif.

Bastian-Morley Co., announces changes and additions to company personnel, in line with its postwar expansion program. The company manufactures Crane water heaters and Crane Basmor boilers, distributed nationally by Crane Co., Chicago, through their branches and wholesalers. Two additions have been made to the executive staff. **Ed. J. Carey,** who has been with the company 23 years, the past 13 years as west coast manager, becomes vice president and general manager. **Ray**

R. J. Rodier

E. J. Carey

J. Rodier, who has been assistant to the president, having general direction of production, purchasing, inspection, personnel and engineering, is made vice-president in charge of manufacturing. **James V. Irvin** becomes assistant to the president. Jim organized the company's personnel department during the early stages of the war, prior to which he served in the sales department for nearly 10 years. The engineering department, nerve center of Bastian-Morley Co., Inc., has been augmented by a new chief engineer, two engineering specialists and four additional draftsmen. **Laurence T. Tegler** returns from the Army to become chief engineer. He was on the Bastian-Morley staff from 1938 to 1942, leaving to accept an Army commission. As a captain, he was executive officer on the B-29 flight engineer training program. **Paul H. Mortimer,** assistant to Mr. Rodier, comes from Detroit Bevel Gear Co., where he was industrial engineer for the past four years. **Frank H. Stockhausen** is a plastics engineer, a new position and department with the company. He was with Cordo Chemical Corp. of Norwalk, Conn., as assistant director of research for the past several years.

John F. Stone, president of **The American Society of Refrigerating Engineers,** was awarded an honorary degree of mechanical engineer by his alma mater, Stevens Institute of Technology.

A member of the Stevens class of 1920, Mr. Stone left before graduation to enlist in the Canadian Royal Air Force, in which he served during World War I. For 15 years he has been associated with the **Johns-Manville Corporation,** where he is now staff manager of the refrigeration section.

At a meeting of the board of directors of **George W. Akers Co.,** Detroit, Mich., the following officers were elected: **George W. Akers,** president; **Harris E. Westrate,** vice-president; **Marshall Bruce,** secretary-treasurer. Captain George W. Akers, United States Naval Reserve, has been on military leave with the Navy since February 7, 1941.

Buffalo Bolt Co., North Tonawanda, New York, has announced the acquisition for cash and stock of the entire capitalization of the **Eclipse Lawn Mower Co.** of Prophetstown, Illinois, manufacturers of hand and power driven lawn mowers. The Eclipse Lawn Mower Company will be operated as a wholly owned subsidiary of the Buffalo Bolt Company. The company will continue under the same management as in the past and will utilize the same channels of distribution that it has used during the past forty years. Through the war period the Eclipse Lawn Mower Company was engaged in the production of tank-tracks and parts. However, it will now revert to the production of a complete and improved line of hand and power driven lawn mowers. As a result of this acquistion the Buffalo Bolt Company's consolidated resources now approximate $9,500,000, while its annual sales exceed $13,000,000.

Election of **Henry F. Dever** as president of the **Brown Instrument Co.,** a wholly-owned subsidiary of the **Minneapolis-Honeywell Regulator Co.,** was announced last month by Harold W. Sweatt, president of the parent company. Mr. Dever, who has been serving as vice-president in charge of engineering for Minneapolis-Honeywell, succeeds Charles B. Sweatt as president of Brown. The latter, vice-president and director of Minneapolis-Honeywell, has withdrawn from Brown and will henceforth devote his entire attention to supervision of the expanded sales activities of the Honeywell organization and its subsidiaries. Mr. Dever will also assume the responsibilities of E. B. Evleth, general manager of Brown Instrument, who, because of ill health, has requested that he be relieved of his duties at an early date. Engineering activities of the parent company will be under the direction of **W. J. McGoldrick,** vice-president in charge of Aeronautical Engineering.

The A. O. Smith Corp. announces that **Wilbert M. Beck** and **Rush H. Hobbs** have joined its Stoker Division as district representatives. Both will work under the direction of R. H. Stuff, Stoker Division Sales Manager in the Chicago office.

Mr. Beck, who has had 16 years experience in various departments of the corporation, will cover Wisconsin,

W. M. Beck

R. H. Hobbs

Minnesota and the Upper Peninsula of Michigan. He will live in Milwaukee and spend part of his time handling distribution of the stoker in the Milwaukee metropolitan area.

Mr. Hobbs' entire business experience has been in the heating industry, having been connected with the Heating Division of the Gordon Van Tine Co. of Davenport, Ia., for the last 9 years. He will cover Iowa and Illinois and will live in Davenport, Ia.

When the time for Action Comes

OILJAK production facilities, engineers, designers, and shopmen are at your service when you have a question, or a problem having to do with the design, fabrication, assembly, or manufacture of a product in light metals—to solve it satisfactorily, economically, and within the allotted time.

Our experience in manufacturing new, unusual and intricate parts and products, in a minimum of operations, with great precision, and at reasonable cost is available for planning and carrying out a wide variety of projects.

That service may be helpful to you. We invite your inquiries.

MACHINING · STAMPING · WELDING · PLATING
FINISHING · ASSEMBLING

The OILJAK MANUFACTURING CO., Inc.
MONTCLAIR, N. J.
The Job Complete — from blueprint to finished product

AUTO-LITE
Indicating Thermometer
Model F-1
$20.

Shown with capillary tubing for remote reading.

You Benefit 4 Ways with AUTO-LITE INDICATING THERMOMETERS

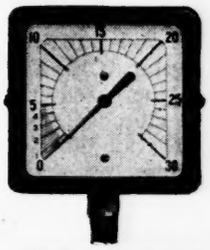
1. Absolute accuracy of temperature indication...

2. No intricate mechanism to get out-of-order...

3. Low cost of instruments due to specialization and large-scale production...

4. Remote reading—temperature observation can be made at some distance from where temperatures are taken. This aids in maintaining systematic temperature observations.

These four features recommend AUTO-LITE *Indicating Thermometers for use wherever uniform temperature is required in heating or cooling. Write for full information on this money-saving, time-saving temperature indication.*



Illustrated at left is a square case pressure gauge, standard pressure ranges up to 500 pounds. This is one of many types of precision measuring instruments made by us for specific industrial applications.

THE ELECTRIC AUTO-LITE COMPANY
INSTRUMENT AND GAUGE DIVISION
CHRYSLER BUILDING, NEW YORK 17, N. Y.

In addition to a wide range of thermometers and gauges, we specialize in the production of instruments of special design for use as a standard part of manufacturers' equipment. Ask us for recommendations for your postwar needs.

Oscar C. Schmitt was elected president of **The Emerson Electric Manufacturing Co.**, St. Louis. He succeeds **W. Stuart Symington**, who was appointed by President Truman and confirmed by the Senate as chairman of the Surplus Property Board. Starting in a minor capacity in the Advertising Department of Emerson-Electric in 1910, Mr. Schmitt has successively held almost every major post in advertising, sales, promotion, sales and executive management, in the Emerson-Electric organization.

O. C. Schmitt

In 1934 he was in charge of advertising and sales promotion. By 1936 he had advanced to the position of vice-president in charge of fan sales—in 1938 he became a director of the company—in 1939 he was made vice-president in charge of general sales, and in 1940 was elected executive vice-president of the company.

Plans are under way for the immediate construction of a new two-story research laboratory for **The Arco Co.**, Cleveland paint manufacturers, for the development of improved paints, lacquers, varnishes and new industrial coatings. The laboratory, which is scheduled for completion early in 1946, will be of structural steel and brick construction and will be located adjacent to the company's general offices at 7301 Bessemer Ave., Cleveland.

The upper floor will be given over entirely to product development work, and the ground floor to an evaluation and testing laboratory, resin research and a pilot plant for experimental production of new synthetic resins. Complete facilities for the accelerated testing of new and experimental finishes will be provided in controlled temperature rooms.

Whiting Stoker Sales Co., manufacturers of domestic and commercial stokers, announces the appointment of **John R. Cameron** of 11613 Santa Rosa, Detroit, Mich., as representative for their various products in Michigan.

The Foxboro Co., Foxboro, Mass., maker of industrial instruments for measurement and control, announces that **Mr. Clarence Leslie Williams** has joined its staff of sales engineers whose headquarters are in the company's New York office, 420 Lexington Ave. He has been assigned to the northern New Jersey territory and has already entered upon his new duties. Mr. Williams is a native of New Jersey and a graduate of Stevens Institute of Technology, at Hoboken.

Mercury Clutch Corporation has moved into its new plant at 1520—12th Street, S.W., Canton, Ohio. In its new quarters the company plans an increased production of its line of mercury-controlled clutches designed to facilitate the starting and acceleration of electric motors and internal combustion engines.

For its achievement in safety, establishing new records and at the same time maintaining war production quotas, **Commercial Shearing & Stamping Co.**, Youngstown, Ohio, has been awarded a recognition certificate by the United States Department of Labor. Of the 3,135 industrial companies in Ohio, the Commercial company is the 27th to receive this type of award. In accepting the award, President Charles B. Cushwa said it is as significant as when the company was awarded three years ago the coveted Army-Navy "E" for meritorious war production.

Victor Electric Products, Inc., of Cincinnati, has announced the appointment of **Howard F. Doll** as chief engineer.

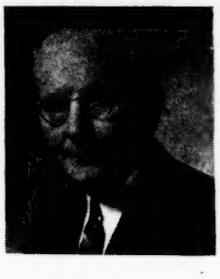
Alco Valve Co. has announced the election of **Mr. Russell Maguire** as president and general manager, succeeding Arthur B. Schellenberg, whose resignation became effective August 31st. Mr. Maguire, who owns control of the Company, has been active in the management of the Company since 1937. During this time Alco has expanded from less than 100 to over 500 employees. Mr. Maguire is best known as president of Maguire Industries, Inc., of New York, first famous as the sole manufacturer of the world-renowned "Tommy" Gun, now among the top producers in the electronic industry. Among his other activities are numbered Meisener Manufacturing Company of Mount Carmel, Illinois, producers of fine radios and phonographs, Thordarson Electric Manufacturing Company of Chicago, builders of transformers for fifty years, Columbia Machine Works of New York, manufacturers of centrifuges and dairy equipment, and Micro-Ferrocart Company of Stamford, Connecticut, engaged in the field of powdered metal parts for electronics and mechanical uses. He is also active in the oil and food industries in this country and in several industrial companies in Central America. As a part of his new program for Alco Valve, Mr. Maguire has announced his intention to increase the capital of the Company to provide a greater interest for continued postwar planning and to expand Alco's production along the lines of its regular business.

The **Iron Fireman Manufacturing Co.** has taken over the plant and business of the **L. R. Teeple & Co.**, makers of automatic heating control instruments. Operation under Iron Fireman management became effective August 1.

Production at the Teeple plant has been concentrated almost entirely on control instruments made for Iron Fireman since its beginning in 1923, except during the recent war years when production has been primarily war equipment, chiefly the making of bomb fuses. The plant will now be known as the Heating Control Division of the Iron Fireman Manufacturing Co.

C. D. Carter, division sales manager of the southern division of the company in Atlanta, Georgia, has been promoted to manager of the central division with headquarters in Cleveland, Ohio. The central division territory includes Indiana, Kentucky, Michigan, Ohio, West Virginia, and Pennsylvania. Mr. Carter is being succeeded by **S. W. Alford**, district representative in the southern division, who will take over the duties of division sales manager.

Harry A. Feldbush, formerly works manager of the Holyoke, Mass., plant of **Worthington Pump and Machinery Corp.**, has been named vice-president in charge of engineering for the entire corporation. His duties cover engineering activities of all works and domestic subsidiary companies. His headquarters will be at the general offices in Harrison, N. J. **Ralph M. Watson**, formerly chief engineer of the Centrifugal Engineering Division, has been appointed assistant to Mr. Feldbush.



H. A. Feldbush

Directors of the **Refrigeration Equipment Manufacturers Association** opened their annual midsummer meeting as the guests of F. J. Hood, newly elected president.

The REMA directors also considered resuming their all-industry refrigeration and air conditioning show as soon as war conditions permit, and favored holding this show in the civic auditorium in Cleveland where 200,000 to 250,000 sq ft of floor space would be available. March or October, 1946, were discussed as the tentative dates.

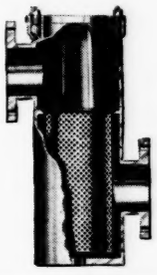
PROTECT valuable equipment *with* ADSCO STRAINERS and SEPARATORS

Prevent shutdowns — prolong the life of equipment — increase steam efficiency with ADSCO Strainers and Separators.

The **Y STRAINER** has a screen that is held in place by a removable plug that permits easy removal for cleaning. It protects traps, regulators, valves and other equipment from the wearing out and destructive action of foreign matter.

Y STRAINER

The **SUCTION STRAINER** screens out chips, gravel, dirt and other foreign matter. Protects all kinds of pumps and other heavier equipment where bulk liquid is contaminated with foreign matter.



SUCTION STRAINER

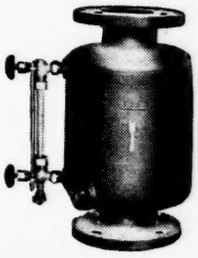
AMERICAN DISTRICT STEAM COMPANY
NORTH TONAWANDA, N.Y.
MAKERS OF "UP-TO-DATE" STEAM LINE EQUIPMENT FOR OVER 65 YEARS.

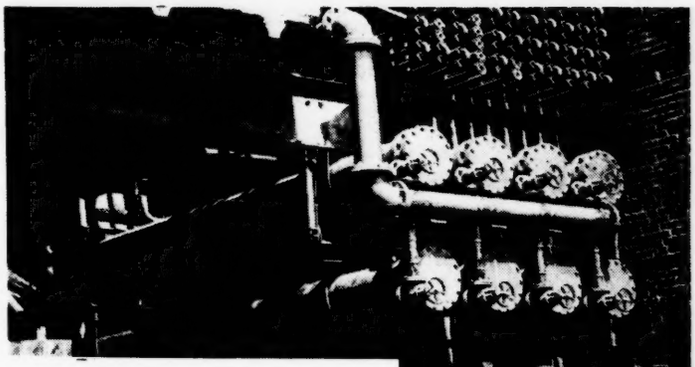
Adsco SEPARATORS

Remove oil and water from steam—increase its efficiency by delivering it dry.

L e f t — Horizontal Type.

R i g h t — Vertical Type for either up flow or down flow.





Conseco ammonia heat exchanger installation, Stanley Theatre, Philadelphia.

CONSECO

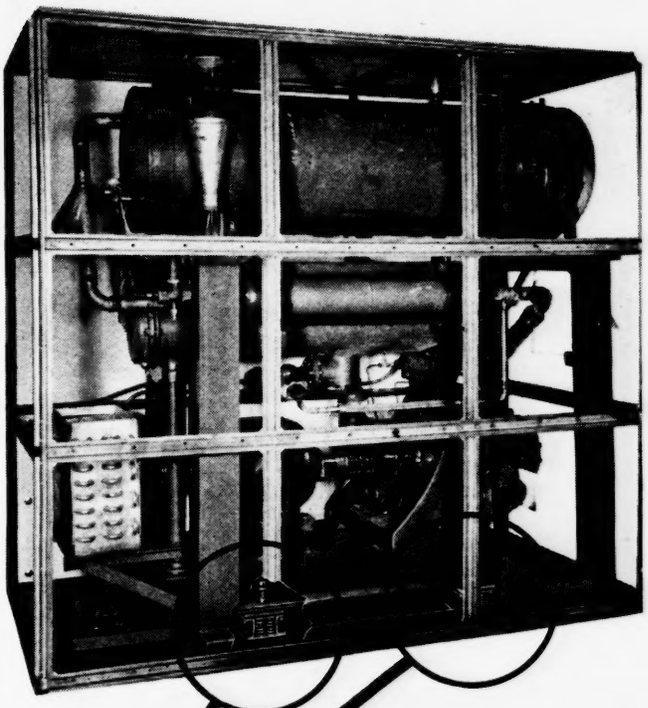
HEAT EXCHANGERS for Air Conditioning

Twenty years' specialized experience designing, fabricating and servicing heat exchangers assure sound design, quality construction and economical operation with any type refrigerant. Engineering assistance gladly furnished. Write.

CONDENSER SERVICE & ENGINEERING CO., INC.
63 RIVER STREET, HOBOKEN, N. J. • *Phone Any Time*

CONDENSERS • LOW PRESSURE EVAPORATORS • AIR EJECTORS • HEAT EXCHANGERS • PUMPS

TUBE CLEANING GUNS AND PLUGS
AIR AND EROSION ELIMINATORS
BEVEL GEAR UNIVERSAL JOINTS
STRAINERS, GREASE EXTRACTORS
WIZARD INJECTORS, FILTERS



For Complete Comfort From Air Conditioning

ELIMINATE VIBRATION

On any air conditioning installation where noise and vibration are objectionable, there is a need for Korfund Vibration Control. This includes most installations, for even when noise is not a factor, vibration is the foe of efficient operation.

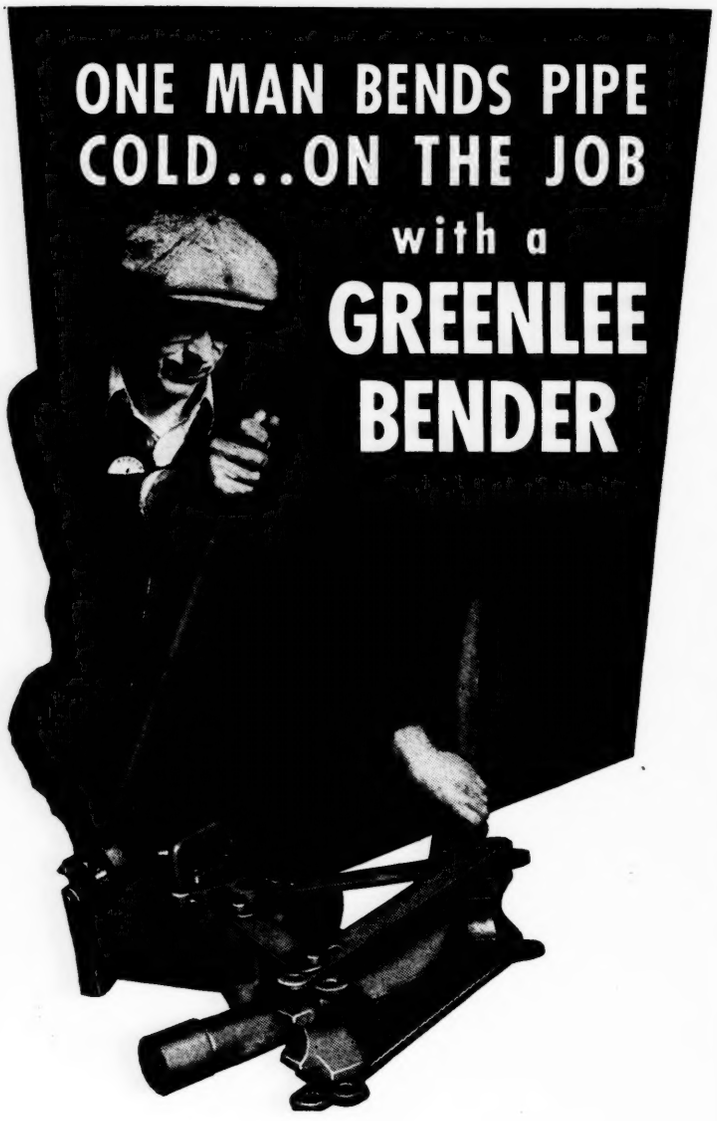
With Korfund isolated fans, compressors and motors, it is possible to operate air conditioning equipment in any part of a building without disturbing employees or customers.

Korfund engineers have had experience controlling vibration from all types of air conditioning equipment under widely varying conditions. Consult them on your own problems, without obligation.

KORFUND
VIBRATION CONTROL

THE KORFUND COMPANY, Inc., 48-33 32nd ST., LONG ISLAND CITY 1, NEW YORK

ONE MAN BENDS PIPE COLD...ON THE JOB with a GREENLEE BENDER



Speed piping installations this efficient, easy, economical way. Make "on the job" bends in pipe *up to* 4½" with a GREENLEE Hydraulic Bender.

With a GREENLEE *one man* gets smooth, accurate, uniform bends in a few minutes. And you save greatly through the elimination of manufactured bends, many fittings and the work of threading them. Yet, in time-savings alone, the GREENLEE pays for itself quickly by letting you move on to more new jobs.

Simple to operate, easy to carry, easy to set up and shift from job to job. The GREENLEE lets you bend pipe exactly where and when you want it! *Ideal for radiant heating jobs!*

For details, write today for your free copy of Bender Booklet S-116. Greenlee Tool Co., Division of Greenlee Bros. & Co., 2329 12th Street, Rockford, Illinois.

Get Ready with Greenlee!

REGISTERED TOOLS

GREENLEE

FOR THE CRAFTSMAN

The 28th annual meeting of the **Stoker Manufacturers Association** at the Stevens Hotel in Chicago on August 22 and 23, with over 100 present, was the society's first postwar conference.

A complete national advertising and sales promotional campaign for the industry was presented and thoroughly discussed.

Officers of the association pointed out that competition between manufacturers of different types of fuel-burning equipment and the producers of coal, gas and oil will be more active and more aggressive than ever before.

New officers of the association are Walter Sormane, Mendota, Ill., sales manager, Conco Engineering Works, president; George W. Graham, Chicago, president, Eddy Stoker Corporation, vice-president; Claude A. Potts, Lebanon, Ind., vice-president, U. S. Machine Corporation, secretary-treasurer. Marc G. Bluth, Chicago, was re-appointed executive secretary.

An educational conference on instrumentation sponsored by the **Carnegie Institute of Technology** and **The Instrument Society of America** has been arranged for October 16, 17, and 18. The program will be divided into two parts. The first part will cover the requirements expected by industries and the second part will be devoted to present training in instrumentation.

Chairman of the Committee is Dr. B. R. Teare, Jr., Head of the Department of Electrical Engineering of the Carnegie Institute of Technology, Pittsburgh 13, Pa. Due to traveling requirements, the conference is limited to fifty and invitations will be sent to those in the order in which applications for attendance are received. Applications should be made to Dr. Teare.

Allen H. Bearse, Jr., New England manager of **The Anthracite Industries, Inc.,** for the past four years, has resigned to take over management of the solid fuels division of the **Barrows Coal Co.,** Brattleboro, Vt. Educated in heating, combustion and air conditioning at Northeastern University and the Massachusetts Institute of Technology, Mr. Bearse has been associated with the solid fuels industry for more than 18 years. A pioneer in the stoker industry in New England, Bearse directed the domestic stoker courses of the Massachusetts University Extension at M.I.T. until the start of World War II.

The election of **S. B. Taylor** as president of **The Parker Appliance Co.,** 17325 Euclid Avenue, Cleveland, Ohio, makers of aircraft and industrial valves and fittings, was announced today by H. I. Markham, Chairman of the Board. Mr. Taylor succeeds Mr. Markham, who has served as president, following the death on January 1st of Arthur L. Parker, founder and chief executive of the company.

An ultra-modern school complete with all the latest refrigeration and air conditioning equipment is slated to be in full operation at the Norfolk U. S. Naval Training Station by fall. It has been in partial operation since Feb. 5.

When completed, the Station's refrigeration school will have a capacity for 200 to 300 enlisted trainees and will graduate a class every week.

The school will teach two courses. The one on maintenance, operation and repair of refrigeration equipment will last four weeks. The second, on maintenance, operation and repair of air conditioning equipment, will last two weeks. Students taking the air conditioning course must have had the one on refrigeration.

Similar to one under construction at San Diego, Cal., the Norfolk school is new in that it is the first such school to be established independent of manufacturing concerns. It is one of the Navy's most advanced schools for enlisted men.

Radiant Heating

An application of radiant heating in a modern industrial garage and service station, is the subject of Case Study No. 5, issued by *A. M. Byers Co., Pittsburgh.*

New Airco Booklet

A new, illustrated, 24-page, two-color booklet, "Oxygen—Indispensable Servant of Industry," telling the story about oxygen—how it is made and how it is used in industry—has been published by Air Reduction Sales Co. Explanatory sections describe the different types of packages for varying oxygen volume requirements, operating conditions, and internal plant gas distribution methods. Also treated is Airco's applied engineering service for technical and on-the-job assistance. Descriptions of hand and mechanical welding, flame hardening, flame cleaning, underwater cutting, hand and machine gas cutting and other flame processes developed or perfected in Airco's research laboratories are included along with photos of apparatus, accessories and supplies and other technical literature.—*Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.*

Freezer Systems

A folder, Bulletin No. TV-345, describing Thermobank automatic systems for freezing temperatures.—*Kramer-Trenton Co., Trenton, N. J.*

Stainless Steel

A 96-page handbook, "Eastern Stainless Steel Sheets." The first 34 pages are devoted to a pictorial review of the importance of stainless steel in various industries, including transportation, architecture, food handling, hotels and restaurants, dairies, chemical processing, laundries, textiles, photographing, hospitals, and paper manufacturing. There is a section entitled "Why Stainless Steel Resists Corrosion." At least a page is devoted to each Eastern Stainless grade of stainless, with appropriate applications of each type. Extensive data on gages, sizes, and tolerances, finishes, and a complete section on processing and fabrication is supplied.—*Eastern Stainless Steel Corp., Baltimore 3, Md.*

Helical Rotor

Pumping without pulsation is the subject of Robbins & Myers' new 16-page Book No. 20, devoted to versatile Moyno pumps. Claimed for this patented design, which requires no pistons, valves, or high velocities, is ability to handle practically anything from free-flowing liquids to non-pourable pastes, low internal turbulence, uniform discharge, long life. Book No. 20 explains how the helical rotor revolves within its stator to create ever-changing seal lines; shows why the simple Moyno is selfpriming, delivers with positive pressure.—*Robbins & Myers, Inc., Springfield, Ohio.*

Fractional-Horsepower Drives

Latest American Fractional-Horsepower Wedgbelt Drives Catalog contains price lists and specifications on the new line of F.H.P. Sheaves and Belts. This new catalog also contains 4 pages of condensed and simplified drive tables for a wide range of center distances and drive ratios.—*The American Pulley Co., 4200 Wissahickon Ave., Philadelphia 29, Pa., Dept. 602.*

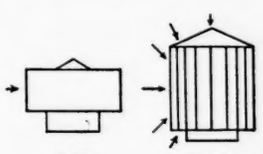
Breidert Air-X-Hauster CHIMNEY TOP

The greatest scientific improvement in Ventilators in over 50 years

TYPE B-2 CHIMNEY TOP

Eliminates smoking fireplaces caused by down-draft

By stopping all down-drafts (interior negative pressure excepted), a Breidert Air-X-Hauster on the chimney absolutely prevents the fireplace from smoking and damaging furnishings. *It provides positive "draw" regardless of wind direction!* Scientifically designed to convert *any* wind current into a powerful suction force, the Breidert remains stationary, has no moving parts. Successfully in use in all parts of the country.



Old Method — Breidert Method

TESTED AND CERTIFIED . . . Thoroughly tested by Smith, Emery & Co. (Pacific Coast branch, Pittsburgh Testing Laboratories) with wind blowing at *all* angles, the Breidert's amazingly high capacities are fully certified.

Breidert Air-X-Hauster Roof Ventilators and Vent Flue Caps

The remarkable ability of the Breidert Air-X-Hauster to provide positive ventilation no matter which way the wind blows, has been proved in thousands of installations throughout the country. Properly installed, the Breidert has *never* failed to fully meet every claim made for it!

TYPE A FOR ROOF VENTILATING — TYPE B — VENT FLUE CAP

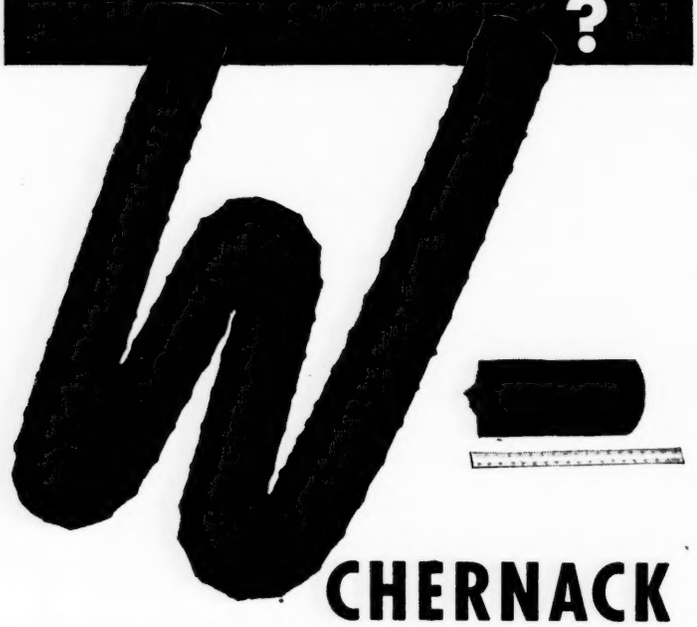
WRITE FOR FREE ENGINEERING DATA BOOK . . . containing specifications and installation data, certified capacities, etc. Address Dept. R.

G. C. BREIDERT CO.

634 South Spring St., Los Angeles 14, California

REPRESENTATIVES LOCATED IN PRINCIPAL CITIES OF THE U. S.

WHERE CAN YOU USE THIS UNIQUE NEW MATERIAL ?



CHERNACK RETRACTABLE DUCT

What it is

A specialized tubing designed to meet the many industrial requirements for a readily portable duct connection for cold or heated air. Light in weight, yet strong and durable. Flexible to a high degree, which permits its use around sharp corners and over obstructions. Stowable into a small space when not in use. When made of light weight fabric, a fifteen foot length can be stowed in a one foot container. When made of heavier fabrics this ratio is somewhat reduced.

Where it has been used

Typical applications on which this type of tubing has been used successfully include airplane engine preheaters, conducting fresh air into ship holds, ventilating tanks, cars and other enclosed spaces, and portable heaters used in temporary buildings, tents and like enclosures.

Why it may prove valuable to you!

Many variations in construction are possible, depending upon the application. The number of spirals can be increased or decreased from standard, which is four per foot length. Many types of flexible material can be used, ranging from light weight cotton or synthetic fabrics to heavy canvas duct. Fabrics may be impregnated where desirable.

Specifications

Standard Inside Diameters: 4 in., 6 in., 8 in., 10 in., and 12 in. Other diameters made to specification.
Temperature of heated air up to 300° F.
Lengths: 2 feet to 50 feet.
Ratio of retractability: 15 to 1 for standard weight material.
End terminations to suit requirements.

For further information write direct to us outlining the applications in which you are interested. We will be glad to submit our recommendations.

THE WIREMOLD COMPANY
Industrial Textile Division
Hartford 10, Connecticut

Pressed-Metal Specialties

New bulletin illustrates and describes the facilities of The American Pulley Company to produce "Precision Engineered" Pressed-Metal Stampings, Spools and Reels. —*The American Pulley Co., 4200 Wissahickon Ave., Philadelphia 29, Pa. Dept. 702.*

Vibration Control

Vibration control is now being applied to many kinds of machines and equipment in varied industries. The effects of vibration on plants, equipment and personnel and methods of controlling vibration are explained in a new 12-page bulletin "Vibration in Industry."—*The Korfund Co., Inc., 48-15 Thirty-Second Place, Long Island City 1, New York.*

Industrial Adhesive

A 12-page booklet, "3-M Adhesives In Industry," which should be interesting and helpful to users of adhesives, sealers, coating or insulating compounds, impregnators and sound-deadeners, illustrates and describes adhesive operations in many different industries, methods of application and a listing of the physical properties.—*Advertising Department, Minnesota Mining and Manufacturing Co., St. Paul 6, Minn.*

Mechanical Rubber Goods

Fifth Edition of "Manhattan Rubber Products for Industry," a condensed catalog of mechanical rubber goods, has been completed. Described in this catalog are many mechanical rubber products and special items manufactured by Manhattan Rubber. Particular emphasis is given transmission and conveyor belting, V-belts, hose, packing, molded rubber products, rubber roll coverings, tank linings, and abrasive wheels.—*The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J.*

Refrigeration

A new refrigeration catalog describing new and improved Weatherhead Refrigeration products. This catalog shows in cross-section and exploded views all of the various parts furnished by this company. It is divided into six sections describing valves, dehydrators, strainers, manifold assemblies accessories and fittings. — *The Weatherhead Company, Cleveland 8, Ohio.*

Deming Progress

A booklet of the institutional type entitled "Deming Pumps Everywhere" shows the diversity of Deming pumps. A history of The Deming Company since its founding in 1880 is illustrated with plant views and photographs of the founders and present staff. — *The Deming Co., Salem, Ohio.*

The Rotameter

A new edition of "Theory of the Rotameter" is now ready for distribution. This 24-page booklet covers such subjects as the history and technical development of the area-type flow meters, and the explanation of how the Fischer & Porter patented Ultra-Stablvis Rotameter overcomes the effects of viscosity and density in flow rate measurement.

Fischer & Porter also offers the third, revised edition of "A New Era in Flow Rate Measurement," a 32-page brochure which discusses and illustrates the advantages of the rotameter for flow rate measurement. A third Fischer & Porter publication, "Armored Rotameters," describes the company's line of armored indicating and recording meters.—*Fischer & Porter Co., 974-A County Line Road, Hatboro, Pa.*

Heating and Melting Equipment

An illustrated 12-page catalog of heating and melting equipment describes torch flame burner equipment, fire guns, pipe compound melting furnaces, steam thawers, salamanders, etc.—*Hauck Mfg. Co., Brooklyn 15, N. Y.*

Water Treater

Despite the general lifting of W.P.B. regulations, supplies of water treating chemicals are tight and may remain so. An offset sheet reproducing an article from a recent issue of *Journal of Commerce* tells how organic-colloidal water treatment which is readily available meets power plant water treating needs.—*American K.A.T. Corp., 331 Madison Ave., New York 17, N. Y.*

Cooling Equipment

The following new bulletins have been issued by Binks Mfg. Co.: Bulletin No. 450—Standard Spray Nozzles for air washing, cooling, brine refrigeration and allied applications. Bulletin No. 800—Type S Atmospheric Spray Cooling Towers in capacities ranging from 10 to 1200 GPM. Bulletin No. 900—Small Series Type K. All Steel, Induced Draft Cooling Towers in capacities ranging from 40 to 600 GPM.

The above publications are in addition to Bulletins No. 600 and 700 recently announced—covering small series, horizontal, induced draft and blower-operated cooling towers suitable for packaged air conditioning and similar applications. Copies will be furnished on letterhead request.—*The Cooling Equipment Division, Binks Manufacturing Co., 3114-40 Carroll Avenue, Chicago, Ill.*

ARMY – NAVY E AWARDS

Kewanee Boiler Corporation, Kewanee, Ill.
(Fifth award)

Handy & Harman, New York, N. Y.
(Sixth award)

American Radiator and Standard Sanitary Corp.
(Chicago Branch)

De Laval Steam Turbine Co., Trenton, N. J.
(Fifth star)

Modine Manufacturing Co., Racine, Wisc.
(Fourth award)

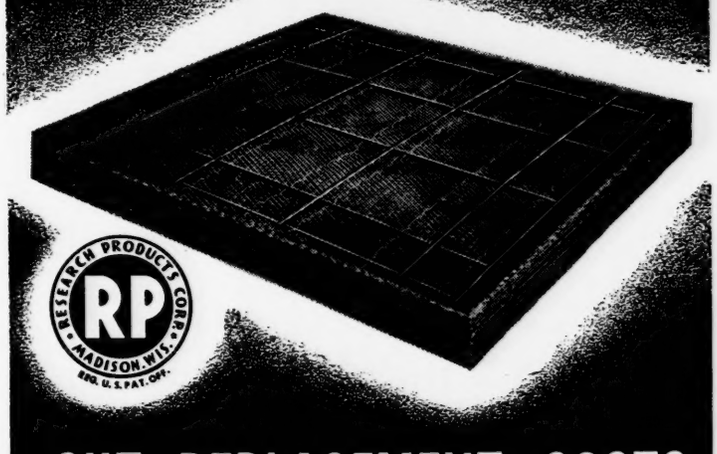
Viking Air Conditioning Corp., Cleveland, Ohio.

York-Shipley, Inc., York, Pa.
(Second white star)

The Youngstown Sheet and Tube Co., Youngstown, Ohio
(Third star)

The Manhattan Rubber Mfg. Division of
Raybestos-Manhattan, Inc., Passaic, N. J.
(Fourth award)

STOP MORE DUST

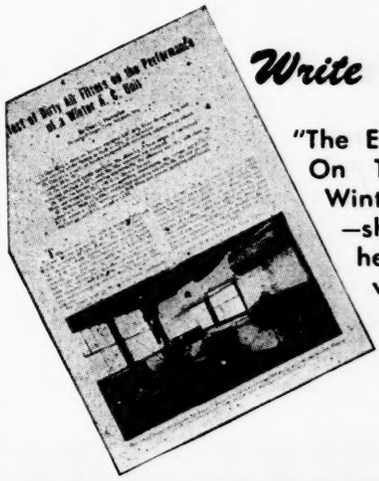


CUT REPLACEMENT COSTS

RESEARCH AIR FILTERS

For Filter Banks and Industrial Dust Collection

HIGH DUST REMOVAL EFFICIENCY—because the air is reversed 21 times in its journey through the Research Air Filter—impinging on more than 30,000 tiny baffles per square foot. LOW RESISTANCE TO AIR FLOW—surface clogging reduced to a minimum.



Write For This Study

"The Effect Of Dirty Air Filters On The Performance of A Winter Air Conditioning Unit" —shows how clean filters cut heating costs, increases air volume circulation. Sent free on request, together with technical data sheets. Write today!

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